

FLIGHT

The
**AIRCRAFT
ENGINEER
&
AIRSHIPS**

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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DIARY OF FORTHCOMING EVENTS.

Club Secretaries and others desirous of announcing the date of important fixtures are invited to send particulars for inclusion in the following list:

Feb. 2	...	Meeting of Royal Geographical Society at Central Hall, Westminster, at 8.30 p.m.
Feb. 2	...	Lecture by Capt. H. Hamshaw Thomas, M.B.E., M.A., F.R.S., before Royal Society of Arts, John Street, Adelphi, at 8 p.m.
April 18 to May 2		Seaplane Competition at Monaco
May 22 and 23		Aviation Competition at Juvisy in connection with Fêtes de Paris
June 1	...	Air Ministry Competition (Small Type Aeroplanes), Martlesham Heath
July	...	S.B.A.C. International Aero Exhibition at Olympia
July (mid.)		Seaplane Contests at Antwerp
Aug. 1	...	Air Ministry Competition (Seaplanes) Felixstowe
Aug. (end of)		Schneider International Race, Venice.
Sept. 1	...	Air Ministry Competition (Large Type Aeroplanes), Martlesham Heath
Sept. (end of)		Gordon-Bennett Aviation Cup, France.

EDITORIAL COMMENT

THE Air Ministry has issued a Notice to Airmen, in which it is announced that summer time in France and Algeria will be introduced at midnight, January 31-February 1, and will continue until midnight, October 23. It is to be hoped that better counsels will prevail here, and that the absurd attempt to vary our lives, which is what "summer time" amounts to, will not be persisted in. As a war measure it served its purpose, but after a fairly lengthy experience of the arrangement, we think the conclusion has been reached by most people that it is a useless business at the best. After all, Nature knows what is best for the world. We were never intended to be semi-nocturnal animals, nor would the habit fit in with natural conditions. Take, for example, the farmer. Setting the clock forward by an hour is of no use to him. His hands turn out at the routine clock time to find the morning mists still lying heavily over the land and the latter full of surface moisture, which forbids work until the warmth of the sun has dried it off. There is an hour wasted at the beginning of the day, which is not overtaken, because work ceases again at the routine hour.

The town worker is not a great deal better off. In spite of what the clock says, he feels when he turns out in the morning that there is some slackening influence at work. What it is he scarcely realises, but it is really that Nature is not properly awake, and he is out too early for health. We are absolutely confident that "summer time" has an adverse effect on the health of the community. It takes the hour off the wrong end of the day, since it gets us up too early in the morning and sends us to bed too early at night. It is true the cricketer and the golfer can persuade themselves that it enables them to play their games apparently well into the night, but that is of very doubtful benefit, and on the whole, we think the idea is a futility. Probably there are many who will disagree with us, but we imagine that if the sense of the community as a whole were taken, it would be found that there is a substantial majority against the perpetuation of an exploded idea. Besides, it was introduced purely as a war measure, and now that the War is a thing of the past, we want to get rid of all

these pestiferous interferences with the established routine of our lives. Let "summer time" die with all the rest of the precious restrictions and limitations of the ineffable D.O.R.A.

The Future of the Air Force

It is abundantly clear that there is a very strong current of naval and military opinion—to apply the mildest possible term—in favour of abolishing the Royal Air Force as a separate Service and making it again a simple auxiliary of the older Services. Col. Repington, in the *Morning Post*, is the latest exponent of this school of thought and devotes, in a recent issue of that journal, a column and a half to a review of the Trenchard memorandum, and, incidentally, to proving that the Air Force can never, within the limits of present vision, aspire to be anything more than auxiliaries of the Navy and Army.

He makes the point that, from a Service point of view, it is necessary that the Air Force should be prepared to operate in the closest co-operation with the other Services, and should not arrogate to itself an independent strategic rôle, though it may occasionally be allotted such a rôle for some special politico-military end. If the Air Force succeeds in its mission and performs the duties laid upon it by the chiefs of the Navy and Army, then it will take its legitimate share in defence, and the Services can be well content for it to remain under a separate Ministry for preliminary training and research. But if the fact of separation causes it to aspire to independence of strategic control, then it is probable that the Navy and the Army will unite in opposition to it, and will be compelled to demand that the Air Service for Navy and Army shall be replaced under the Admiralty and the War Office.

Now, all this is simply assertion, unbacked by sound argument, and so far as we have gone there is only one statement with which we are disposed to agree, and that is that the opinions expressed represent "the Service point of view"—as evolved in the smoking room of "The Rag." What real argument is there against the aspiration of the Air Service to assume strategic control of war in its own element? We do not say, at the moment, that the Air Service actively contemplates anything of the sort, but it may quite conceivably have to do so at some future time and, again, we ask: Why not? If we go back through history we find the very same situation arising in the relations between the land and sea forces of the Crown. It was not until Elizabethan times that the seamen exercised the right of "arrogating to themselves an independent strategic rôle." Until then the seaman was merely a navigator, whose duty it was to obey the orders of the soldier and place his ship where the latter wanted it, so that he could do his fighting in conditions approximating as nearly as possible to those of war on land. It was the army which exercised all the strategic, and even the tactical, control of war at sea, and if we were possessed of the contemporary records showing the heated discussions which undoubtedly took place when the seamen awoke to the realisation that the sea affair was one for them, and that war on land and war at sea were a totally different business, we should find the soldiers advancing the same arguments as those which are being used now in the matter of the Air Service, and its relations with the others.

If we except the remote period before the Christian era and deal only with the wars commencing with the

Conquest, we shall appreciate that no sea battles were actually decisive of a war, by themselves, until we come to the affair of the Spanish Armada. Sea power was, until then, always a mere auxiliary of land power, and such sea battles as were fought were fought to clear the communications in order to land armies in the enemy's country. It is true that sea power is exercised partly to that end now, as we know from the lessons of the recent war, in which our Navy kept the seas for the safe passage of our own and our Allied troops. But that is not its only rôle. There is a separate and distinct strategic bearing in maritime war which may be totally unrelated to war on land, and it is important to note that this does not seem to have been adequately realised until, at the earliest, the reign of Henry VIII, when the Navy Office and Trinity House were established. Indeed, we should prefer to put it that it was in the time of Elizabeth that the real enlightenment began.

It is intensely interesting to see how history is in process of repeating itself. Ten years ago the meaning of air power was not realised, except as a purely abstract proposition. Six years ago the dawning of that realisation was at hand, but the Air Service was the humblest of handmaidens to the older Services. Under the influence of war the Service grew, and as it grew, those who had fostered it began, as did the seamen of the 16th century, to see that there lay in the future a rôle for the new Service far beyond and of infinitely more importance than the auxiliary services hitherto given by the new arm. They saw that, as it is possible for either a Navy or an Army to make decisive war without calling upon the other for aid, so might—so undoubtedly will—air power be called in to decide wars without the interference of either. No doubt that is heresy to the seniors of the older Services, but it is just as certain that when the seamen were urging their right to make war in their own way without the interference of the soldiers there was much wagging of grey beards in the taverns of the time, and many strange oaths were sworn because of the presumption of these ignorant mariners. But the ignorant mariners were right, and they had their way—and the course of the history of war has justified them. To our way of thinking, the analogy is well-nigh perfect and, until sound argument replaces mere assertion of opinion, we shall continue to believe that air power is as important to our existence as either sea or land power. And by air power we do not mean mere strength in auxiliaries to the older Services, but a self-contained and strong Air Force, separate entirely, except with the reservations we have admitted on many previous occasions, from the administration and control of either the Admiralty or the War Office.

Air Routes for Trade

Speaking at a luncheon of the Association of British Chambers of Commerce recently, Mr. Holt Thomas again took the opportunity of pointing out how the apathy of the Government towards civil aviation is destroying our lead in the air. As he pointed out, it is not charity that is wanted, but merely vision and commonsense. Referring to the London-Paris mail service as a case in point, he said that if a load of 400 lbs. per day of first-class mail matter were guaranteed, they would be glad to carry it at 4s. per lb., and the cost would be just over 1d. per letter. If the load were 800 lbs., the cost would be about ½d. per letter. With a guaranteed



(From an original drawing by Roderic Hill)
"THE PARIS Mail": A D.H. 16 and a Handley Page passing each other over the English coast

load of 2,000 lbs., goods today could be conveyed from London to Paris in two hours, leaving out collection and delivery, at 1s. 3d. per lb., whereas the charge for *grande vitesse*, which occupied three or four days, was 1s. 10d. per lb.

Mr. Pike Pease, the Assistant Postmaster-General, replying, said he could not say anything on the subject of air mails, because that did not lie with him. Those present should recognise the necessity for helping on the experimental service between this country and France. If they tried to use that service as much as possible, it might be the means of the inauguration of a much bigger service in the world!

What possible hope is there, when a prominent political official, connected with the very department to which civil aviation must look for its main support, talks like this? It is none of his business—it is not for him to decide whether air mails shall be inaugurated or not. He, poor devil, is only an assistant and without influence, so he will leave things alone. He will not even talk about them—except to get off the pious platitude that it is up to the commercial world to encourage the one existing British air line, because it may lead to bigger things! Why does not his own department encourage it and thus assure development? Really, it passes comprehension that officialdom should be so blind, so pig-headed, in the matter of things that happen to be new? With the figures quoted by Mr. Holt Thomas green in his mind, it might have been thought that the A.P.-M.G. could have been a bit more encouraging as to the attitude of his department. Still, there it is, and the pity of the whole situation is that the lead which was built up during the war at an enormous cost in blood and money, has passed from us. Let there be no mistake about that. It is not *passing*, it has *passed*.

The Bearing on Defence

It is scarcely possible to say which is the worst—the fact that supremacy on the commercial side has been lost, or that we are reverting to the pre-war apathy in aerial defence. As a matter of fact, the two are so interlocked that it is impossible to separate them. They are really one and the same. We have never ceased to urge, since the end of the war threw the whole aerial scheme once again into the melting-pot, that there is but one way to secure that measure of aerial preparedness which is essential to our safety as a nation and an Empire. That is by the possession of a relatively small, but highly-efficient, active Air Force, capable of instant expansion to a war footing when needed. Obviously, there is only one way in which this can be done, and that is by the creation of a great Air Reserve, and the latter must of necessity be commercial in its organisation. It is equally clear that private enterprise cannot alone maintain such a reserve and that the Government should come to its assistance. Nor does such assistance necessarily connote a system of doles. What it really does mean is that the attitude of mind displayed by Mr. Pike Pease must give place to something more imaginative and that, in place of the politicians who care for nothing except to hold their jobs as comfortably as possible, and with the minimum of trouble to themselves, we must have at the head of the great departments men of vision and a grasp of possibilities. Until we do, we see no hope of progress.

The Value of Long-Distance Flights

The question has more than once been asked by unthinking people: Of what use are the Atlantic and Australian flights? Are they simply advertisements, or what? The answer is that no great advance has ever been made in engineering science without exhaustive preliminary tests to prove that theory is correct in practice. In this case, the development and general use of flying as a means of transport is dependent upon engineers being able to satisfactorily prove to and impress upon the public that flying is not only an immense time-saver, but that it is also a safe method of travel. It is just such a problem as confronted the early railway engineers. It was a very long time before the unthinking and conservative public could be brought to discard travel by stage coach and to trust themselves to be hustled through the country behind a locomotive.

Again, when the petrol motor arrived, continuous experiments had to be made before it could arrive at even a moderate degree of reliability. And then, when the memorable "Emancipation Day" run to Brighton was organised, what was the public view of it all? The enthusiasts who took part in it were voted dangerous madmen by most, and even the well-disposed wanted to know what was the use of it all, even if the cars *did* get to Brighton? Were there not the trains? Yet these trials and tests were not only of use to the engineer and designer by enabling them to discover the weak points in their constructions, but they were also the foundation of public interest and confidence in the motor-car. It took years to bring the necessary confidence to establish the car as a recognised means of transport, but in the end it was done, as we know.

So in the matter of aviation there are two things which have to be done. The first is to try out design and construction. The second is to create and maintain public interest and confidence in the aeroplane as a means of travel. If we analyse the two flights which have done so much to inspire confidence, we shall see that each was admirably constituted to prove its own lessons. In the flight across the Atlantic we had a long-distance non-stop journey of the most strenuous and searching character—the best imaginable proof of the trustworthiness of the aeroplane and its engines under continuous strain and the possibility of a pilot controlling a machine for the necessary period of time. In the Australian flight, we saw a journey by air half round the world, through all sorts of differing climatic conditions, such as would test to the utmost both the design and materials of the engine and machine in great variations of cold, heat and atmospheric humidity, combined with the ability of a pilot to navigate in the air with perfect precision over land and sea and to find aerodromes in all parts without undue difficulty.

Surely, such flights as these must convince the public that aviation and the aeroplane have reached a stage of relative perfection which entitle them to be classed as trustworthy? We submit that this is so, and that so far from such flights possessing no particular value except as advertisements, they are, on the contrary, exceedingly valuable, from the point of view that they have demonstrated that practice accords with theory, and also that they have supplied a remarkable object-lesson in the reliability of aircraft as a means of transport.



SOME BRIEF NOTES DEALING WITH THE DIFFERENT TYPES OF AERO ENGINES EXHIBITED BY THE VARIOUS MAKERS

BY THE TECHNICAL EDITOR

ALTHOUGH there was, generally speaking, little in the way of novelties at the Paris Aero Show, one came away with the impression that, almost without exception, the general excellence of design and the extremely high quality of the workmanship and finish were far in advance of anything seen, or even dreamt of, at the Paris Show of 1913. Naturally this unprecedented development has been mainly due to the exacting requirements of the War, and to the fact that, as a result of the War, manufacturers have been in a position to experiment on a scale that would not otherwise have been possible. The high state of perfection to which aero engine design and construction have attained is thus a direct result of war conditions, and as aeroplane performance is mainly a question of load per h.p., it will be realised how intimately the high speeds and extraordinary climbs of which the modern aeroplane is capable are connected with the progress in engine

efficiency. It is perfectly true that, for commercial flying, such high performances will not be required, but the fact should not be lost sight of that, although this is so, of two engines of a given horse power, and having the same reliability, and the same petrol consumption, that which is the lighter will be chosen, because it leaves a greater margin for useful load.

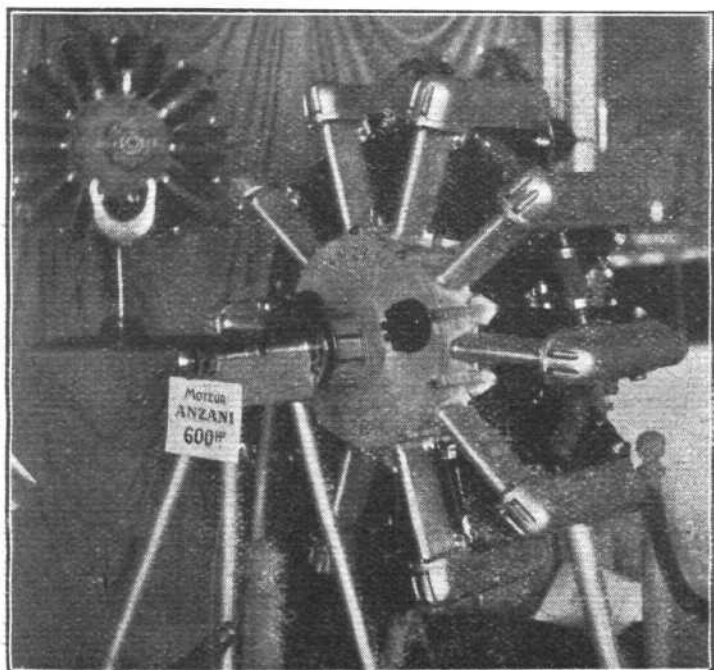
Trend of Design

As to the trend of design, it would appear that for powers above 200 h.p. or so, water cooling is generally adopted, while for lower powers air cooling seems to be the favourite. When, however, it comes to the matter of types in the two classes, it is no longer possible to generalise and to state that any definite type has a preponderance. In the air-cooled class of engine one finds the two-cylinder opposed, the three-cylinder radial, the multi-cylinder radial, the four-cylinder vertical, and the multi-cylinder rotary. A feature which one could not help noticing was the comparative absence of the air-cooled Vee type of engine. The water-cooled class was represented by a variety of types, ranging from the simple vertical, through the Vee, the W, or, as it is generally called on this side of the channel, the "Broad Arrow," the twin Vee, to the X type. Also there was shown in the water-cooled class a double twin vertical—the Bréguet-Bugatti. It will thus be seen that, while for high powers the water-cooled engine is in the majority, there is no indication as to which type of engine in this class will survive, and there does not appear to be a great deal to choose between the various types. Probably the type which is found to be the simplest to instal in an aircraft—and by instal we mean not only the mounting, but also the cowling, etc.—will stand the best chance. Although it is now generally supposed that the rotary will give place for the radial type of air-cooled engine, there was little indication at the show of this being so, the rotary type being very well represented, and one firm at least was showing an entirely new model of rotary engine of low power.

In the following notes we do not propose to give a complete catalogue of all the engines exhibited, but will confine ourselves to dealing briefly with those which appear to be of new type, or to possess novel features of detail design.

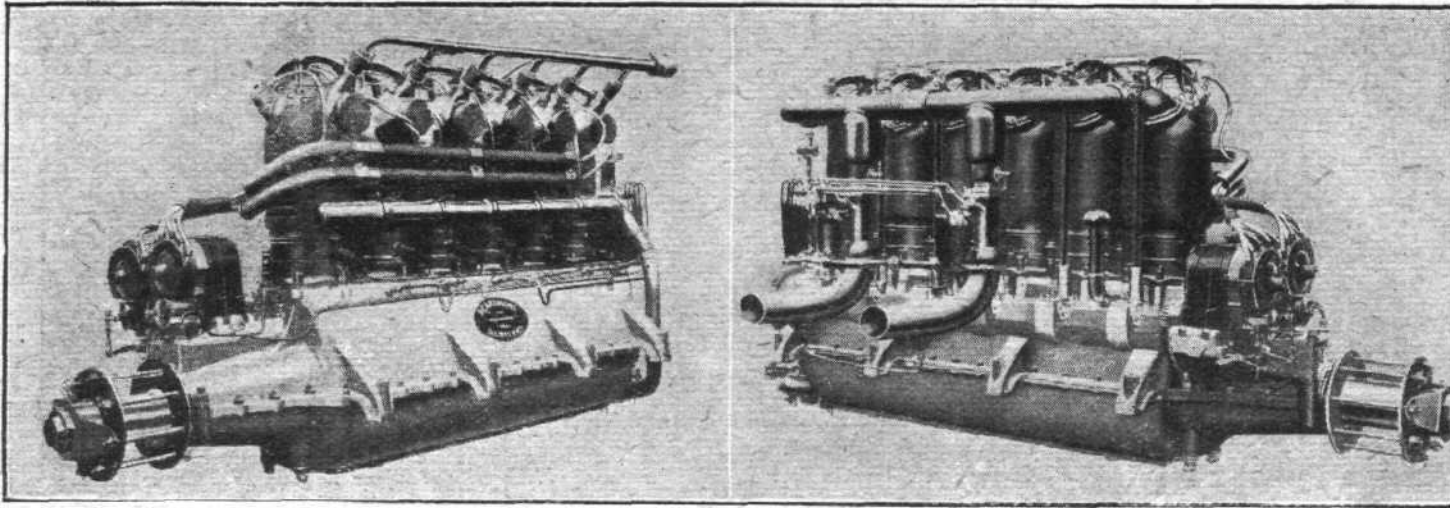
Anzani

In a dark, out-of-the-way corner of the gallery M. Anzani showed an imposing series of engines of his design, ranging from the old fan type, similar to that with which Blériot crossed the Channel in July, 1909, through the Y type 35, the 6-cylinder 40-45, the 6-cylinder 50-60, the 10-cylinder 100-110, to the new radial water-cooled Anzani engine of 600 h.p. All the air-cooled engines are already well known to readers of this journal, and we need not therefore refer to



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The 20-cylinder, 600 h.p. Anzani water-cooled engine. The cylinders are arranged in pairs, one behind the other, each pair having an overhead camshaft



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THE 160 h.p. BEARDMORE ENGINE : Induction and Exhaust sides

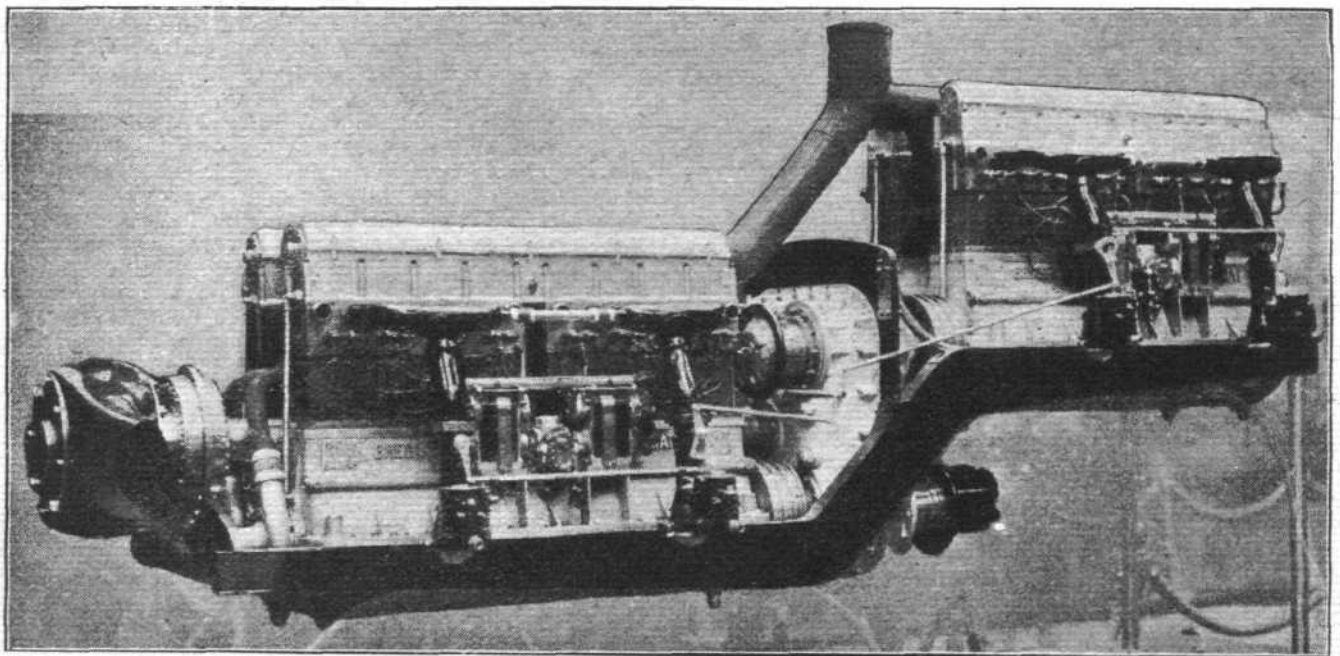
them in detail. The new water-cooled engine is, however, a novelty, and possesses several new and interesting features. As will be seen from the accompanying photograph, the 600 h.p. Anzani water-cooled engine is of the radial type, but differs from usual design, in that the 20 cylinders are arranged in 10 pairs. Each pair has an overhead camshaft, driven by bevel gearing. In external appearance this engine is of extremely clean design. It will be noticed that the distributors are mounted on the front cover of the crank case. Unfortunately particulars as to weight, fuel consumption, etc., of this engine were not available, but later we hope to be able to publish a more detailed description.

Beardmore Aero Engine, Ltd.

This famous British Aero engine firm had been somewhat unfortunate in the allocation of stands, being hidden away in the upper gallery, where, it is to be feared, it did not attract the attention it deserves. In fact, the representatives of several journals have failed to make any reference to it, although professing to mention all the British engine firms which exhibited at the Paris Show. The fact that Messrs. Beardmore were not included in the official catalogue may also have been, to some extent, responsible for this omission. The Beardmore exhibits included only those engines which have been in use during the War, and the design of which is already so familiar to readers of *FLIGHT* as to require no detailed reference here. The 120 h.p. engine was an old and tried friend already before the War, and the 160 has done extremely useful work during the War, mainly as installed in the Arm-

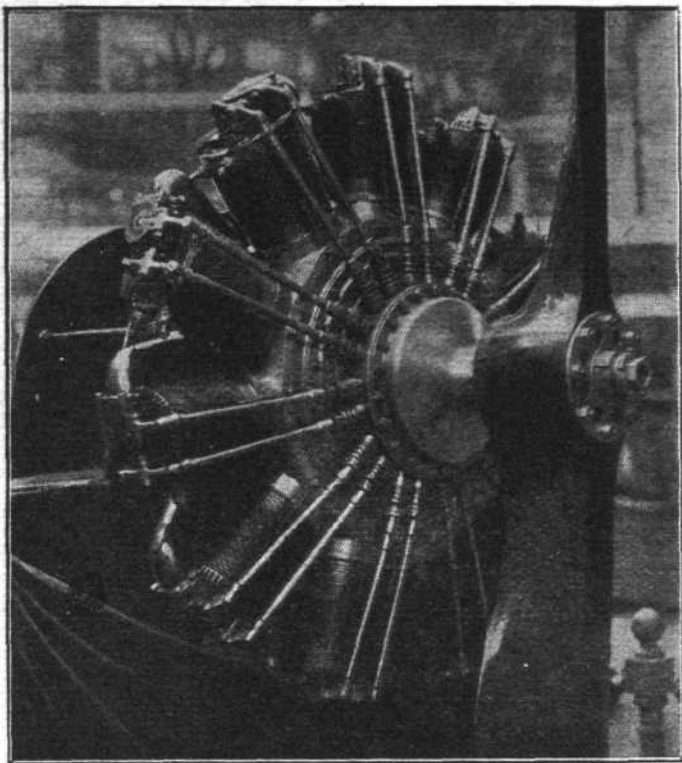
strong-Whitworth machines, but also in other types, and although ultimately superseded by more powerful engine the Beardmores were used on night-bombing work up to the end of hostilities.

As regards the commercial possibilities of the Beardmore aero engine, it may be remembered that some months ago we published in *FLIGHT* an account of the purchase by Messrs. Beardmore of all the Beardmore engines in existence from the Government, and it was then stated that each engine would be tested and sent out with its complete test history sheet and a graphic record of the endurance run. As the number of engines purchased back ran into thousands, it will be understood that Beardmores are in a position to furnish spare parts at a moment's notice, which, coupled with the fact that immediate delivery can be guaranteed, should go a long way towards popularising the Beardmore engine for use on civil aeroplanes and seaplanes. For certain classes of work the high power of the more modern aero engines will not be required, and it is for this class of work that the Beardmore engine will be found useful. It is true that the weight per horse-power is somewhat greater than that of the most modern designs, but, on the other hand, the Beardmore is designed to run comparatively slowly, which means less wear and tear on bearings and reciprocating parts, and the feasibility of using direct drive, thus avoiding the use of reduction gearing. For that matter the weight is not prohibitive, being less than 8 lbs. per h.p., complete with radiator, water, fuel, oil, and tanks for a six hours' flight.



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THE BREGUET-BUGATTI POWER UNIT : This unit, which is rated at 800 h.p., consists of two Bréguet-Bugatti engines placed end to end, and one slightly higher than the other, and driving a main airscrew shaft. Automatic clutches throw either engine out of gear in case of a breakdown



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A 200 h.p. Bréguet rotary with variable compression : This engine was built under licence, the originators being Damblanc-Mutti.

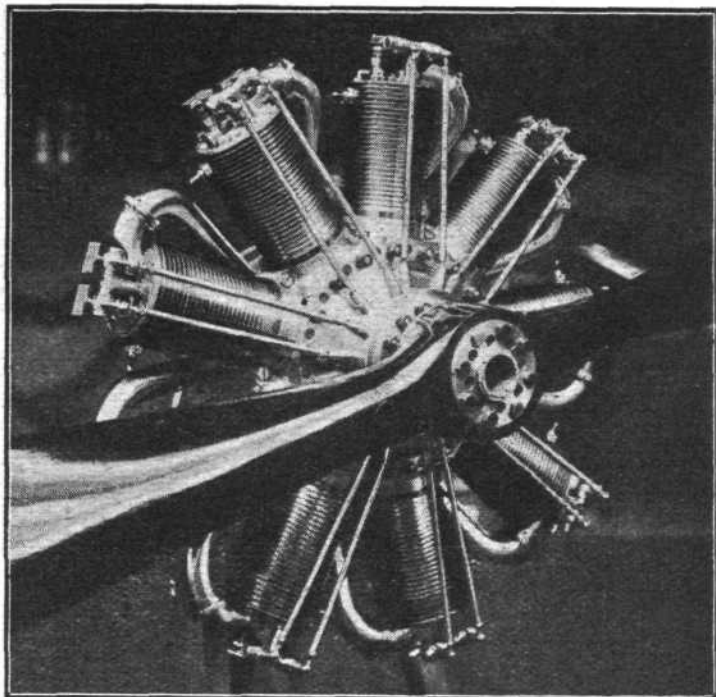
Louis Bréguet.

In addition to his aeroplanes and seaplane, M. Bréguet exhibited an engine unit developing some 800 h.p. This consists of two Bréguet-Bugatti engines, placed end to end, but one slightly higher than the other. The Bugatti engine, it will be remembered, consists of two vertical 8-cylinder units, placed side by side on a common crank case. In the Bréguet-Bugatti combination this arrangement is made use of to accommodate the propeller shaft, which runs through the space between the cylinders of the lower engine. A series of automatic clutches are provided, which ensure that in the case of a breakdown of one engine, this is automatically thrown out of gear, and the only effect of the breakdown is that one-fourth less power is transmitted to the main airscrew shaft. The arrangement, although probably doing all that is claimed for it, looks very complicated and somewhat heavy, but for airship work it might find its use. Compared with other engines of the same, or even greater power, of which several types were shown, the Bréguet-Bugatti would appear to be unnecessarily complicated.

On the Bréguet stand was shown also a rotary engine of 200 h.p., about which it was said that it had variable compression, but as the engine was built under licence, the originators being apparently Damblanc-Mutti, no particulars were available as to how this variation is brought about. In external appearance the engine looks very much like any other rotary, the only unusual feature one noticed being the method of springing the valves. This was accomplished by auxiliary rockers, placed under the main ones, operated by coil springs passing down along the outside of the cylinders to eyebolts on the circumference of the crank case. In the case of the exhaust valves the object was evidently to get the springs away from the hot gases, but in the case of the inlet valves, it is less obvious what were the advantages of this arrangement, except possibly the question of accessibility.

Clerget, Blin et Cie.

The exhibits of this firm were somewhat in the nature of a series of "milestones," the engines shown ranging from the earlier days of the firm down to the latest engines designed. Thus one saw on this stand a specimen of the 60 h.p. 7-cylinder type 7Y of 1912, the 80-h.p. 7-cylinder type 7Z of 1913, the 130 h.p. 9 cylinder type 9B of 1916, the 200 h.p. 11-cylinder type 11 EB of 1917. Of the latter type a sectioned model was also shown. This type, it may be remembered, had the induction pipes on the front (propeller) end of the engine. Of modern types only two were exhibited. Of these one was a type 9J 9-cylinder rotary of 110 h.p. Although maintaining its general family resemblance to previous Clerget engines, the type 9J shows various minor modifications. Thus the induc-

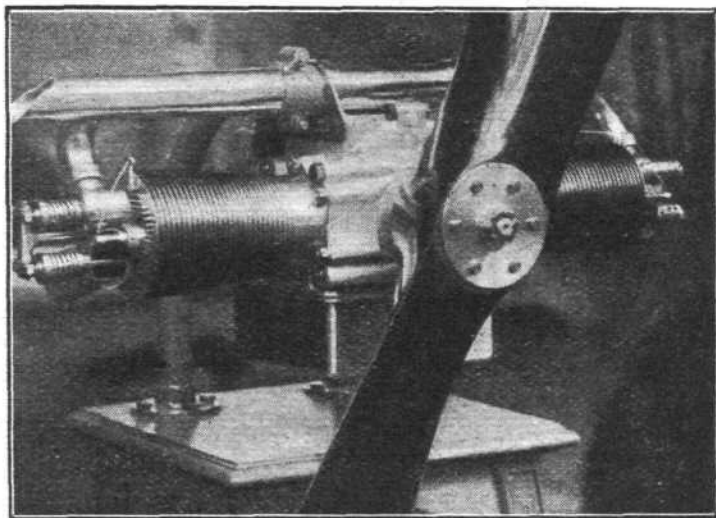


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The Clerget 9-cylinder, type 9J, rated at 110 h.p.

tion pipes issue from the crank case behind the space between adjoining cylinders, and have a pronounced lateral bend at the top, where they are joined by means of two flanges. Also, instead of the elliptical section formerly characteristic of Clerget engines, the 9J has induction pipes of circular section. The bore and stroke of the 9J is 105 mm. and 140 mm. respectively, and the weight of the engine is 115 kg. (about 253 lbs. or 2.3 lbs. per h.p.).

The only other engine of new type exhibited was a small



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A CLERGET RADIAL : This small stationary engine, the type 2K, is rated at 16 h.p. and drives an airscrew of 3 ft. 6 ins. diameter.

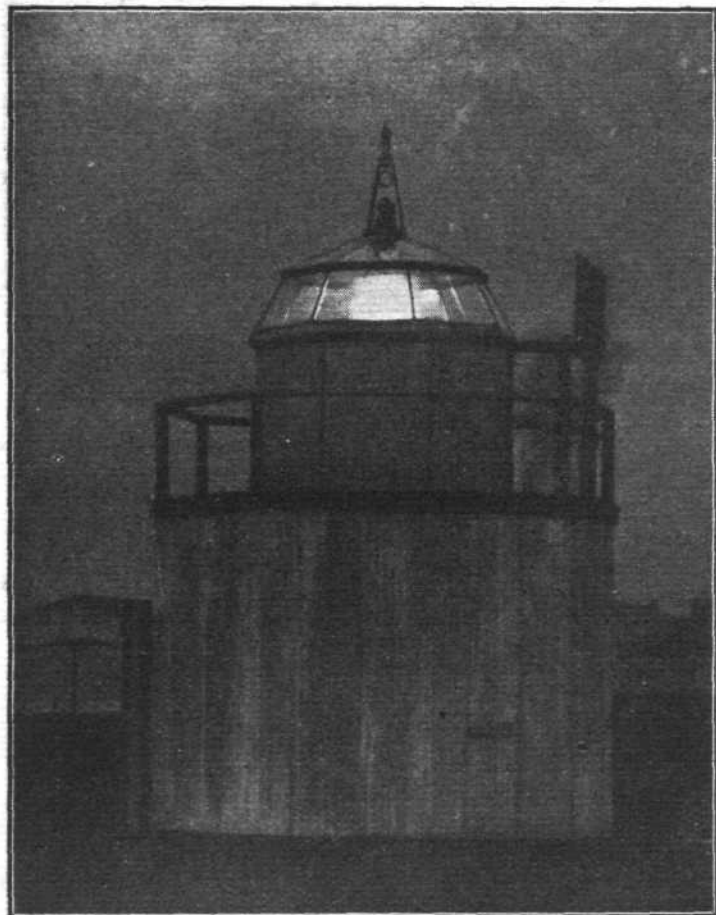
two-cylinder radial, known as the type 2K, rated at 16 h.p. This small engine is fitted with an airscrew of 3 ft. 6 ins. diameter only, and is a very pretty little job, although one does not think that the power will be quite sufficient, even for a very small machine after the style of the de Marçay "Passepartout." The bore and stroke is 85 mm. and 100 mm. respectively. The weight is stated to be 22 kg. (48.4 lbs., or just over 3 lbs. per h.p.). If made slightly larger, so as to develop about 20 h.p., there should be quite a market for such a small light engine, as in that case a very useful machine could be built, having the necessary reserve of power for climbing, etc., but when only 16 h.p. is available, it will mean that the engine has to run all out continuously, and there will be little or no reserve when the power begins to drop off.

(To be continued.)

AERIAL LIGHTHOUSES

NO MATTER how much the aeroplane or airship may be developed, commercial aviation can never really achieve success unless those essentials such as aerodromes, landing grounds, route indicators, lighthouses, etc. are equally developed. No one expects maritime navigation to carry on without its harbours, docks or lighthouses—all of which receive as much consideration and attention as the design and construction of the ships themselves.

The question of lighthouses for aircraft is in itself a most interesting subject, full of important problems. At first it would be thought that we already have a series of night guides



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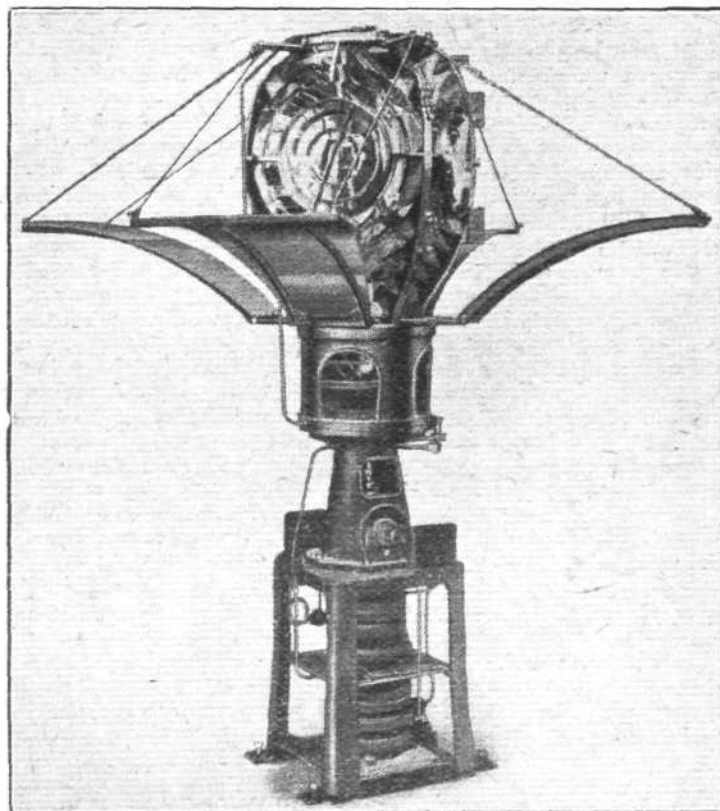
The "AGA" Aerial Lighthouse installed at Hounslow. The "Sun Valve," the automatic "lamp-lighter," is seen on the pinnacle of the house

for aircraft in the existing marine lighthouses, but here it must be pointed out that their utility in this respect is considerably restricted, inasmuch as the arrangement of the optics in them is such as to give a light of maximum power within an area more or less at ground level, so that the light would be visible to an aviator only at comparatively low altitudes and at a long distance from the light. It is obvious that what is required of an aerial lighthouse is one that is clearly visible within its range from any point in the upper hemisphere and which also has a perfectly clear and precise light character. No doubt those of the existing marine lighthouses that are suitably located can and will be adapted to meet these requirements, but lighthouses specially for aircraft will certainly be necessary. For some time past Messrs. The Gas Accumulator Co., of Brentford, who are responsible for many of the marine lighthouses installed throughout the world, have been experimenting with aerial lighthouses, with the result that they have produced a lighthouse that not only appears to meet the requirements already mentioned, but also possesses some other very important features which render it particularly suitable for aerial work. One of these lighthouses was recently installed at the Hounslow Aerodrome, and is now undergoing its trials. Through the courtesy of the designers, we are able this week to give our readers a few brief particulars of this most interesting apparatus. Perhaps the most important feature of this light is its remarkable, and almost uncanny, automaticity. Having once been erected in its station, it will—barring, of

course, accidents due to extraneous causes—operate *absolutely* unattended for periods of 12 months or more! Years of service with "Aga" marine lights, employing the same system, have proved beyond doubt the reliability of this system. It requires but a moment's consideration to perceive the great advantage of such a feature as this in connection with the question of aerial lighthouses, especially on routes over large tracts of uninhabited areas in Australia, India, Egypt, etc. The flashing apparatus, which can be adjusted to give any desired grouping of flashes, is operated by the gas as it passes to the burner.

The hemispherical candle-power of the light source in the focal plane is 125, and the optics surrounding this are so formed and placed as to intercept the light rays leaving the light source, and direct them in the desired direction. The result of collecting these rays and directing them into a certain confined area is that the light through each of the four or more faces of the lens approximates 70,000 candle-power. The optics in this light are so disposed as to cause a beam of light of high power to be projected from each lens slightly above the horizontal plane, and, in addition, a portion of the light emitted from each panel of the lens is directed into the upper hemisphere; actually a fan-shaped distribution is obtained from each panel of the lens, so that the light is visible, within its range, from any point of the upper hemisphere. This is illustrated by the accompanying curve showing the range of visibility.

The light source in this unit is an incandescent mantle of special manufacture, the fibre used having a far greater degree of elasticity, and consequently longer life, than is usual. The intrinsic brilliancy of the mantle is, approximately, 50 candle power per sq. cm. The life of an incandescent mantle being

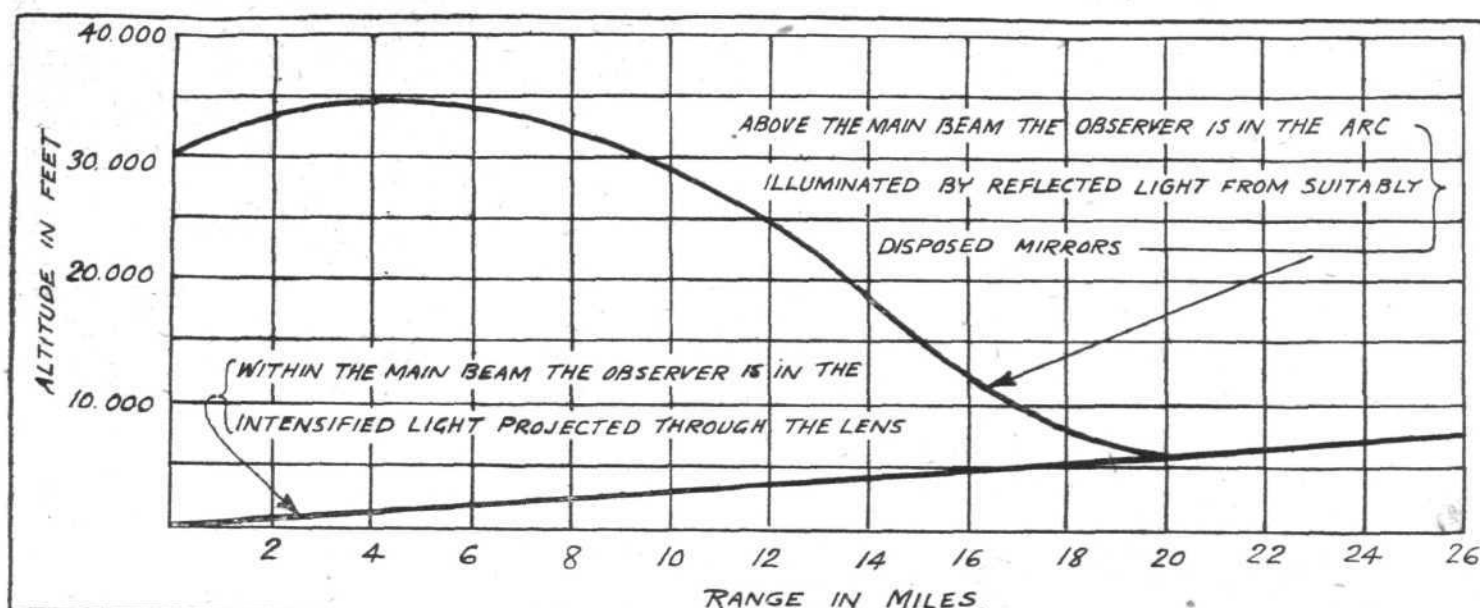


"Flight" Copyright

THE "AGA" AERIAL LIGHTHOUSE: A view of the complete lamp and mechanism. There are four revolving lens panels giving 12 flashes per minute, the candle-power of each beam being 70,000

inconsistent, a means of avoiding the possibility of the light being extinguished from this cause is employed. A mechanically-operated mantle exchanging device is fitted, which automatically replaces a damaged mantle. By this means a number of spare mantles are held in reserve.

The lens, which is mounted on a turn-table, is caused to rotate by the action of certain moving parts in the automatic gas and air mixer, through which gas passes to the burner. Suitable gearing connects the mixer and turn-table, and, as



"Flight" Copyright

THE "AGA" AERIAL LIGHTHOUSE: Curves showing the visibility of the direct and reflected beams

the consumption of gas by the burner is a constant quantity, the speed of rotation of the lens cannot vary. This arrangement not only obviates cumbersome and costly clockwork, which requires frequent attention for winding, but, since the power used in this operation is derived from the gas in passing to the burner, it ensures that the lens always rotates when the light is burning, and ceases to rotate when the light is extinguished.

The light is controlled by means of a "Sun Valve," the function of which is automatically to light and extinguish the burner at darkness or dawn. The action of the valve is entirely dependent on atmospheric conditions—no clockwork is employed, nor does it require any attention. Upon the

valve being set to operate within certain limits of light and darkness, it will do so quite independently of the time of day, and whenever this degree of darkness, whether it be due to the natural darkness of night or fog, is reached, the burner is immediately and automatically switched "on," and "off" again when light again appears.

The illuminant used is dissolved acetylene stored under pressure in portable steel cylinders (classed by the Board of Trade as non-explosive). As the amount of gas consumed in any given period can be accurately predetermined, a sufficient supply of gas can be given to maintain the light for periods of one year, or longer, if necessary, and during such periods absolutely no attention whatever is required.



The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Aviators' Certificates Issued by the Royal Aero Club *Revised Regulations*

A MEETING was held on Wednesday, January 21, 1920, when representatives of Civilian Flying Schools were invited to meet the Sub-Committee of the Club which had been dealing with the revised regulations for Aviators' Certificates.

The following were present:—

Mr. G. B. Cockburn, in the Chair.
 Lieut.-Col. Spenser D. A. Grey, D.S.O.
 Lieut.-Col. Alec Ogilvie.
 Capt. W. H. Kelley (Cambridge School of Flying).
 Mr. F. B. Fowler (Eastbourne Aviation Co.).
 Mr. F. E. Etches (Bournemouth Aviation Co.).
 Mr. G. Castleman (Central Aircraft Co.).
 Mr. P. T. Chamberlayne (Grahame-White Co.).

Mr. H. C. Wright of the Cheltenham Aviation Co. and Mr. A. V. Roe were unable to be present.

The Chairman reported that the Club had decided to alter the tests for Aviators' Certificates, and that in future candidates would require to pass the following tests:—

(A) A flight without landing, during which the pilot shall remain for at least an hour at a minimum height of 2,000 metres above the point of departure. The descent shall finish with a glide, the engines cut off at 1,500 metres above the landing-ground. The landing shall be made within 150 metres or less of a point fixed beforehand by the official examiners of the test, without starting the engine again.

(B) A flight without landing around two posts (or buoys) situated 500 metres apart, making a series of five figure-of-eight turns, each turn reaching one of the two posts (or

buoys). This flight shall be made at a height of not more than 200 metres above the ground (or water) without touching the ground (or water). The landing shall be effected by:—

- (i) Finally shutting off the engine or engines at latest when the flying machine touches the ground (or water).
- (ii) Finally stopping the flying machine within a distance of 50 metres from a point fixed by the candidate before starting.

In each test the candidate must be alone in the flying machine.

The Chairman further reported that this Certificate would be accepted by the Air Ministry as a certificate of competency for a private pilot's licence, *i.e.*, a licence which is not valid for carrying passengers for hire or reward.

The question of Civilian Flying Schools being officially approved by the Royal Aero Club was discussed, and it was the general feeling that this course should be adopted. Regulations were drafted and approved.

Hydro-Aeroplane Competitions, Monaco, April 18-May 2, 1920

The closing date for receiving entries for the Hydro-aeroplane Competitions at Monaco on April 18-May 2, 1920, is February 29, 1920.

Entry Forms can be obtained on application from the Royal Aero Club, 3, Clifford Street, London, W. 1.

Offices: THE ROYAL AERO CLUB,

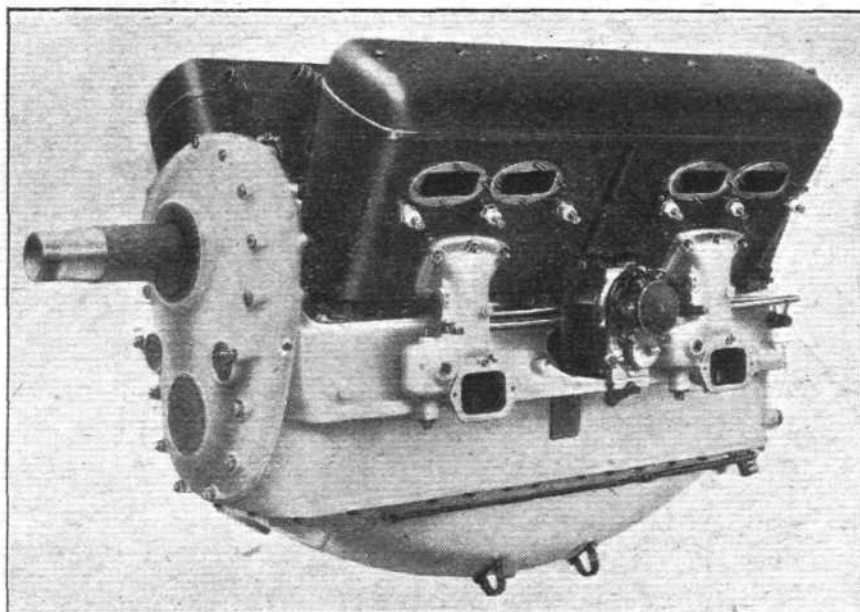
3, CLIFFORD STREET, LONDON, W. 1.

H. E. PERRIN, Secretary.

TWO NEW FIAT AERO ENGINES

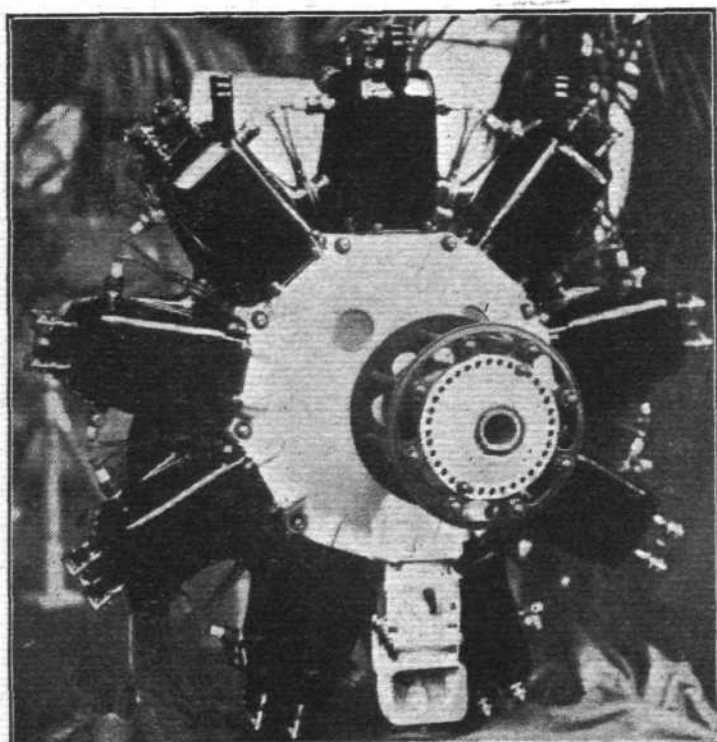
THE A-15 R. 400 H.P. 12-CYL. "V"

A SHORT time before the end of the War the Fiat Co. produced a new type of twelve-cylindered aviation engine developing more than 400 h.p. With the signing of the Armistice immediate construction was not undertaken, but this engine has given such excellent results under test that it has now been decided to place it on the market.



The Fiat A-15 R. 400 h.p. twelve-cylindered "V" aero engine—a remarkably "clean" design

The main objects sought in this engine were complete accessibility of all organs requiring regular attention, such as magnetos, carburettors, valves, water pump, oil pump, etc., and at the same time to reduce area and weight in relation to the power developed. This engine, which is officially designated A-15 R. is one of the cleanest-cut and most pleasing-looking aviation engines ever built. While external pipes and exposed mechanism have been avoided throughout, accessibility has not been diminished, but is much greater than on other engines produced up to this time.



The Fiat A-18 300 h.p. nine-cylindered radial water-cooled aero engine : View of the front or air-screw end

The V-type twelve-cylindered engine possesses considerable advantages over the vertical six of equal power. The crankcase and the crankshaft are shorter, the shaft diameter is smaller, while the effort exerted on the individual cranks is smaller, all of which tends towards a reduction in weight.

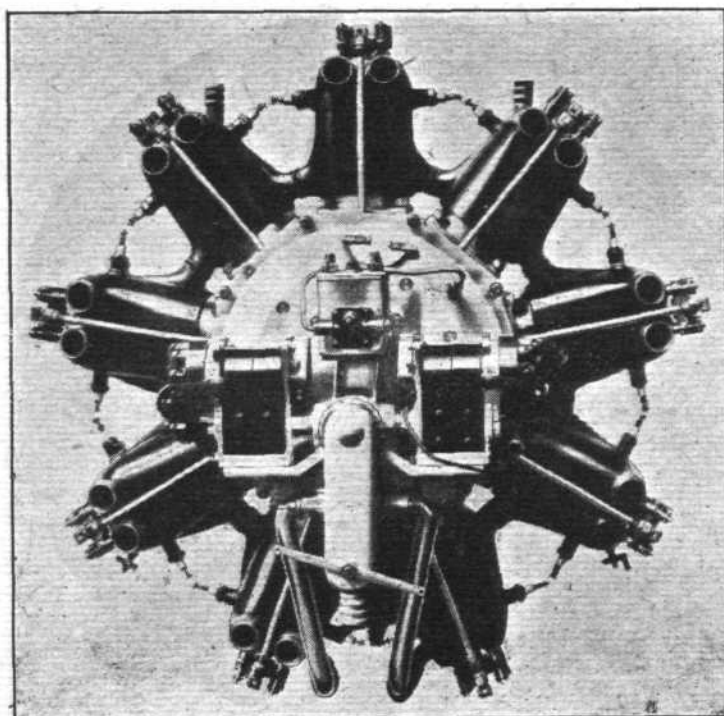
In the twelve-cylindered engine the equilibrium of the inertia and centrifugal forces is perfect, while the more regular impulses reduce vibration to a minimum, to the great advantage of the propeller. The only objection which can be brought against the twelve-cylindered V-engine is that it requires more attention than a six-cylindered engine by reason of the greater number of plugs, carburettors, valves, etc. In the new Fiat this objection has been diminished, if not entirely removed, by careful designing with accessibility prominently in view.

The cylinders are separate steel forgings welded together in groups of three, with a common water-jacket for each line of six. An interesting feature is that the intake manifolds are of sheet steel passing inside the water-jacket between the centre and the outer cylinder of each group of three. This is a very fine example of the art of acetylene welding, and has the advantage of providing internal manifolds heated by the circulating water, with carburettors bolted up direct to the outside of the cylinder-blocks. It avoids the usual complication and inaccessibility of carburettors placed in the angle of the cylinders.

There are four valves per cylinder mounted in the head, with the exhaust led away from the outside from four ports for each line of six cylinders. The valves are operated by an overhead camshaft for each line of cylinders. Rocker arms with an adjustable mechanism for valve-stem clearance are used, and the whole is covered by a sheet steel housing.

which both prevents oil leakage and adds to the clean appearance of the engine.

Each overhead camshaft is operated by a bevel-gear mounted on the centre of the crankshaft and an inclined and enclosed shaft. These two drive-shafts are telescopic, in order to allow for expansion by reason of heat, and the central location of the valve-operating gear adds to the purity of lines of the entire engine. The bevel-gear which serves to drive the camshaft also operates the gear-type oil pump placed in the lowest portion of the base-chamber. The water pump is at the rear of the engine, driven direct from



The rear or magneto end of the Fiat A-18 300 h.p. radial aero engine

the crankshaft, and the air compressor pump is driven off the water pump by means of reduction gears.

The crankshaft is carried in five intermediate bronze bearings lined with white metal, and a very heavy ball-bearing at each end. Tubular connecting-rods are used with articulated ends. The pistons are light aluminium-alloy type with cast-iron rings. There are two magnetos mounted centrally with their distributors facing outwards, and placed midway between the two carburettors on each side. The carburettors are four in number, being one for each set of three cylinders. They are of cast aluminium, and are automatic at all engine speeds. With this arrangement the carburettors, the magnetos and the spark-plugs are perfectly accessible by removing one side of the engine-housing. These are parts of the engine which need most frequent attention and adjustment, and which have, therefore, been made most readily accessible.

The propeller is a geared-down type, with a ratio of 1 to 1.51. The reducing gears are herring-bone type, and the propeller shaft is of very big diameter, and is mounted on heavy radial and thrust ball-bearings. This shaft was originally intended for a machine gun to be fired through it, and is bored to 58 mm. internal diameter. The propeller, which may be either pusher or puller type, is locked on the shaft with a mechanism very similar to that of Rudge-Whitworth wire wheels.

Cylinder bore is 120 mm., with a piston stroke of 150 mm. The engine develops 400 h.p. at 2,300 revolutions, and gives its maximum of 425 h.p. at 2,500 revolutions. Being geared down, the maximum propeller speed is 1,500 revolutions. Weight of the engine empty is 800 lbs., and weight with water and radiator 903 lbs. Weight per horse-power empty is exactly 2 lbs., and weight complete with water and radiator 2.3 lbs. per horse-power.

THE A-18 300 H.P. 9-CYL. RADIAL

The Fiat Co., having specialised during the War on vertical and V-type water-cooled aviation engines, the appearance of a nine-cylindere water-cooled star type comes somewhat as a surprise. The first sample of this series was exhibited at the Paris Aviation Salon, where it attracted considerable attention.

The nine cylinders are steel forgings with welded-on water-jackets, and are mounted around a circular aluminium crankcase. The intake pipes are inside the water-jackets, and consequently are heated by the water-circulation system. There are four valves per cylinder mounted in the head and operated from a single-plate cam and push rods. The crankshaft, which has a single throw, and is carried in ball-bearings, receives the master connecting-rod and the eight auxiliary rods, all of which are mounted in ball-bearings. Ignition is assured by two high-tension magnetos mounted on a platform on the rear face of the crank-chamber. Each magneto fires nine plugs, which are mounted horizontally in the cylinders below the valves; thus either magneto is capable of running the engine. On the same face of the crank-chamber is the double piston-type oil pump, and immediately below it is the water pump. The single carburettor, with adjustment for high altitude flying, is also on this side of the engine. The mixture is taken through gas passages in the base-chamber to the pipes inside the water-jackets, and from there to the valves in the head.

This engine, designated Type A-18, develops 300 h.p. at 1,080 revolutions, and 320 h.p. at 2,000 revolutions. Its total weight empty is 500 lbs., and with water 546 lbs. The weight per horse-power is thus 1.6 lbs. without water, and 1.9 lbs. with cooling water.

Correspondence

The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

COL. HOLT ON PARACHUTES

[1991] My attention has just been drawn to a letter under the above heading by Mr. Calthrop in your issue of the 15th inst.

No one can fail to admire Mr. Calthrop's great ingenuity and the fine design and admirable qualities of his Guardian Angel parachute, unsurpassed for certain specific purposes—and it is perhaps a pity that he should have imported a personal tone into his letter.

Under the circumstances I will not trespass on your valuable space with more than a few brief comments. Mr. Calthrop lectures me severely for my use of the term "positive." Apparently he has "earmarked" this word and appropriated it to connote a certain definite thing—in effect "A parachute stowed on the Calthrop principle." Seemingly he would convert the term into a mere label for his special method of packing. I entirely demur to this definition, more especially as I have in mind an "Anti-suction" parachute without any bulky container or open mouth, to which this definition would be quite inapplicable, or if applied meaningless. After all it is a mere side issue, of no importance provided each party makes clear the sense in which he applies the word.

Mr. Calthrop makes a number of very sweeping assertions and generalisations. I will refer to one only. He claims that his parachute, not only the Guardian Angel, but apparently every modification, is *infallible*. This is a strong word, more usually associated with popes or patent medicines. I have been told (Mr. Calthrop will no doubt correct me if I am in error) that not long ago there was a bad disaster in the United States owing to the parachute rope becoming entangled in the aeroplane's "bloater," and this though the machine was flying normally under control and the parachute itself was in charge of the Calthrop Co.'s own trained experts. This only shows that you cannot have ropes dangling in proximity to the machine without attendant risks.

Mr. Calthrop apparently must himself at some time have begun to have misgivings as to whether his standard type Guardian Angel would be really effectual in the actual conditions that were likely to arise in the case of a sudden aeroplane collapse. For he seems subsequently to have patented various different types specially designed, as he

himself says, to meet some particular emergency or to suit some particular type of machine. A few only of these figure in the Calthrop Co.'s price list, and it would be interesting to know whether any of the others have been tested by or submitted to the Parachute Section since Maj. Orde Lees left it last spring.

I am glad to be able to assure Mr. Calthrop that I have perused a few of his specifications—some with interest and pleasure, and some, if I may say so, with a little amusement.

And now to "clear the air," if I may use his own words. This varied array of patents on which he appears to set so much store—soaring, dropping, drag, *aileron*, etc., etc.—what are they, and what do they represent?—just so many desperate efforts to circumvent the natural limitations of his own parachute system. Having devised them, having brought them to the working stage, what then? Does he propose to list dozens of different "marks" to suit different types of accidents, different types of machines, and different methods of stowing on the machine? Of course not, that's not practical. And further, does he propose to instal two or three different types of parachutes on one machine, each designed for a particular type of accident, furnished possibly with a sort of switchboard in the cockpit, enabling the airman to "switch on" the particular type of parachute suited to the emergency with which he is confronted? Of course not; that's nonsense.

Further still; in the larger machines, would he equip each passenger with two or three different parachutes, till it resembles nothing so much as a ladies' hatpin stand? Of course not; that's burlesque. What is the alternative? one all-round parachute system, which can be used from anywhere, on any machine, without modification. Not necessarily a "joy-riding" parachute; a parachute is essentially, and will be always, the instrument of an emergency; but a parachute that promises a satisfactory chance of escape in almost any conceivable circumstance. This is the goal, and it looks as if it could be attained only by the "non-positive" type. And that's just the whole of my case.

H. S. Holt

Travellers' Club, January 21

AIRCRAFT UNDERCARRIAGES

BY JOHN D. NORTH, F.R.A.E.S., F.R.MET.SOC.

(Continued from page 106.)

Resistance

AN undercarriage is an essential part of an aeroplane, but, from the point of view of resistance, is an evil as it may and often does provide 15 to 20 per cent. of the total resistance apart from that of the wings. In order to make the aeroplane as efficient as possible this resistance must be reduced to a minimum.

In an undercarriage the resistance is due chiefly to—

- (a) Struts.
- (b) Wheels.
- (c) Interference between the parts.

(a) *Struts.*—In the design of struts the influence of "interference" or the best streamline form and fineness ratio is important. In the case of horizontal members (such as the axle) the fairing should have a high fineness ratio (> 3.5) in order that the flow may be stable with change of attitude.

(b) *Wheels.*—Numerous experiments have been carried out on the resistance of wheels; the resistance is reduced to a minimum by fairing from tread to hub and by adding tail fairing. Owing to the difficulty of attachment, tail fairing,

however, is scarcely, if ever, used. Tread fairing inside and outside reduced the resistance of a wheel to about one third. (See R. and M. 207.)

(c) *Interference.*—The chief interference is between the wheels and the struts with the shock-absorber. Experiments carried out show that this interference is greatest with the wheels faired tread to hub on the inside, so that there appears little difference between rim and tread fairing when interference is taken into account. The best form of fairing for the wheels is tread fairing away from the struts and rim fairing towards it. (See C.I.M. 56.)

The two reports mentioned refer to wheels 800 by 150 mm. and 750 by 150 mm. respectively.

Experiments carried out in Boulton and Paul's 4-ft. channel on a model of the Bourges undercarriage show that with tread fairing outside and rim fairing inside on wheels 900 by 200 mm. the interference was quite negligible. With larger wheels the elastic shock-absorber and the struts are brought relatively nearer to the wheel and so this result is not at all surprising.

An interesting example showing how the resistance of the undercarriage can be reduced by fairing in the case of the B.E. 2C.: As originally constructed the resistance at 100 ft./sec. was 19.4 lbs. This was reduced to 14.3 lbs. by:—

- (a) Tread fairing on the outside of the wheels.
- (b) Covering the axle fairing over,
- (c) Fairing the elastic shock-absorber,

that is, the resistance of the unit was reduced 26 per cent., and of the aeroplane about 5 per cent.

On the Bourges undercarriage the effect of fairing the elastic shock-absorber was to reduce the resistance of the undercarriage by 8 per cent.

In order to obtain satisfactory results for the resistance, former experiments have shown clearly that it is essential to test not separate parts but the complete unit, for in this way only can the uncertain factor of the interference be eliminated.

To throw further light on the development of the oleo gear specimen modern undercarriages of this type will be described. The examples shown are:—

Small machines	.. Siddeley	Siskin.
Medium machines	.. Boulton	Bourges.
Large machines	.. Bristol	Braemar.

Siskin Gear

In the Siskin undercarriage a triangulated structure is mounted on the fuselage from points near the root of the bottom wing spars, and from the apex of the structure radius rods are carried forward to the wheel axle. A pair of oleo legs are jointed to the axle on the inner side of the wheels and sustain the fuselage at the engine plate. The oleo leg is designed with large amplitude, the rubber acting conjointly with the oil dashpot throughout the stroke (Fig. 29.)

The leg gear consists of a pair of tubular telescopic members which together form the oleo dashpot, and which are maintained fully extended by a series of shock-absorber rings mounted on suitable spools. The external telescopic member is jointed to the wheel axle, and carries the upper spool at its upper extremity. The internal telescopic member attaches

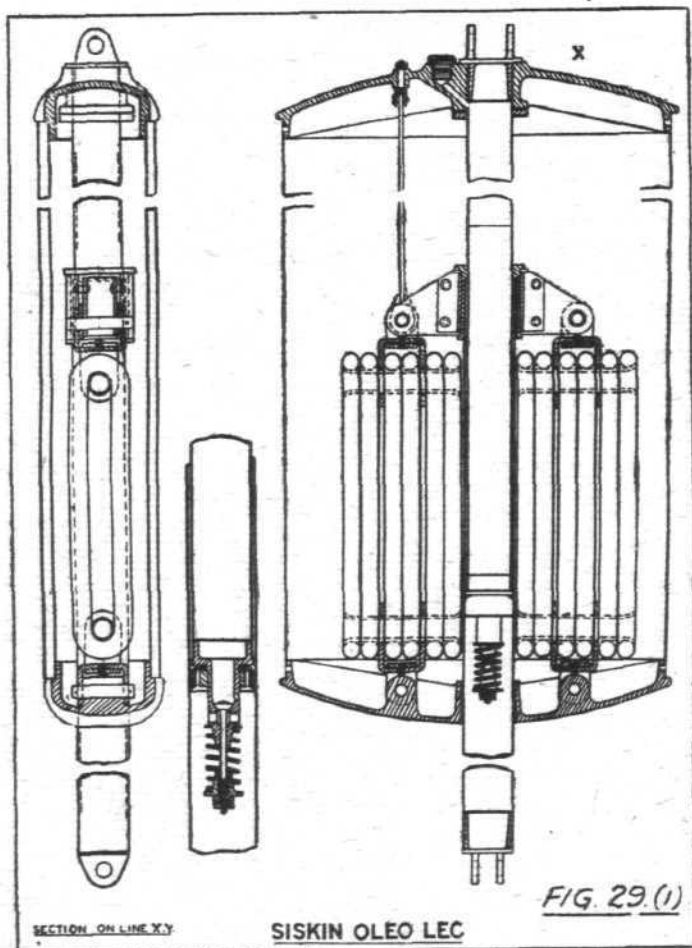


FIG. 29. (1)

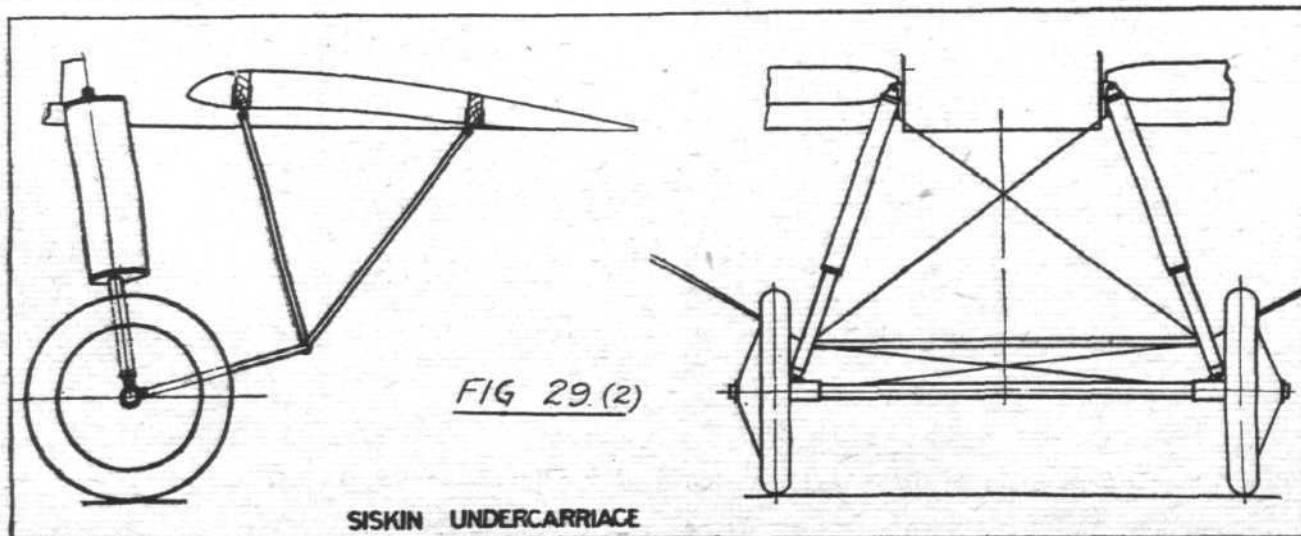


FIG. 29. (2)

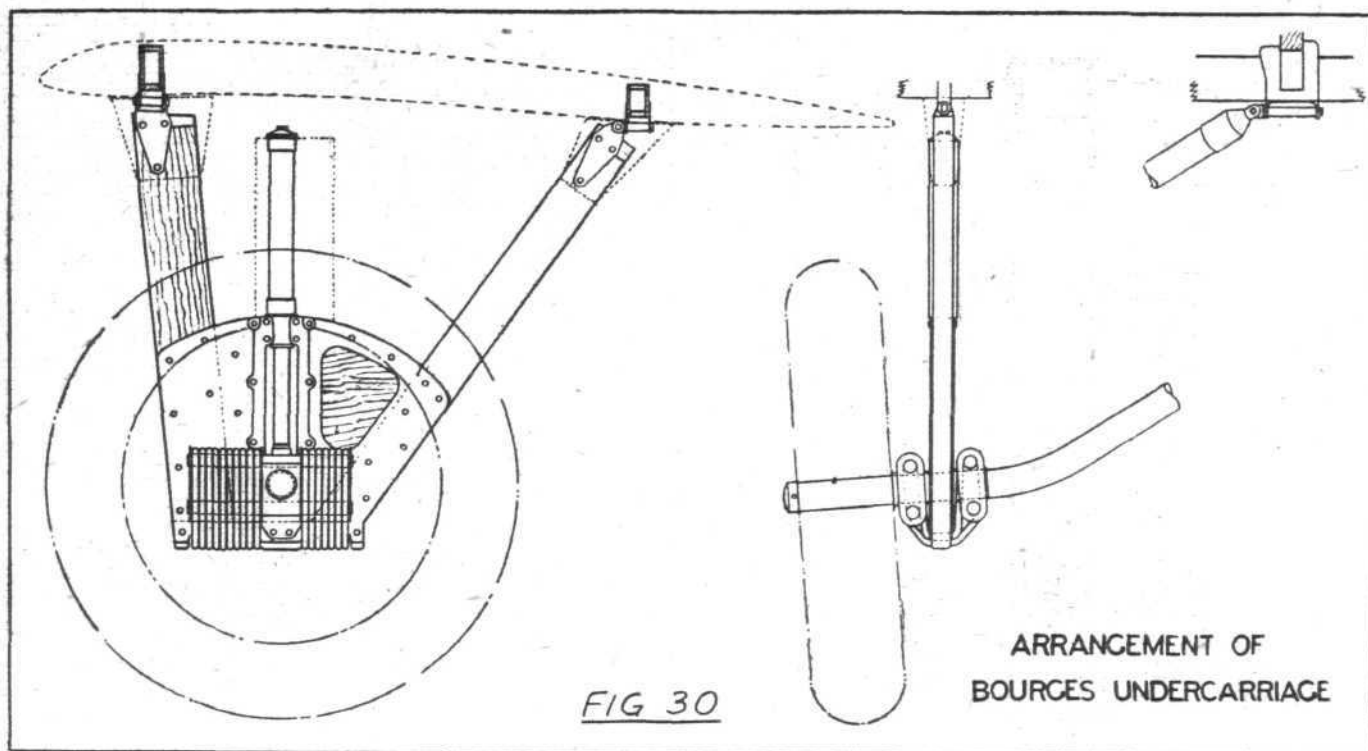
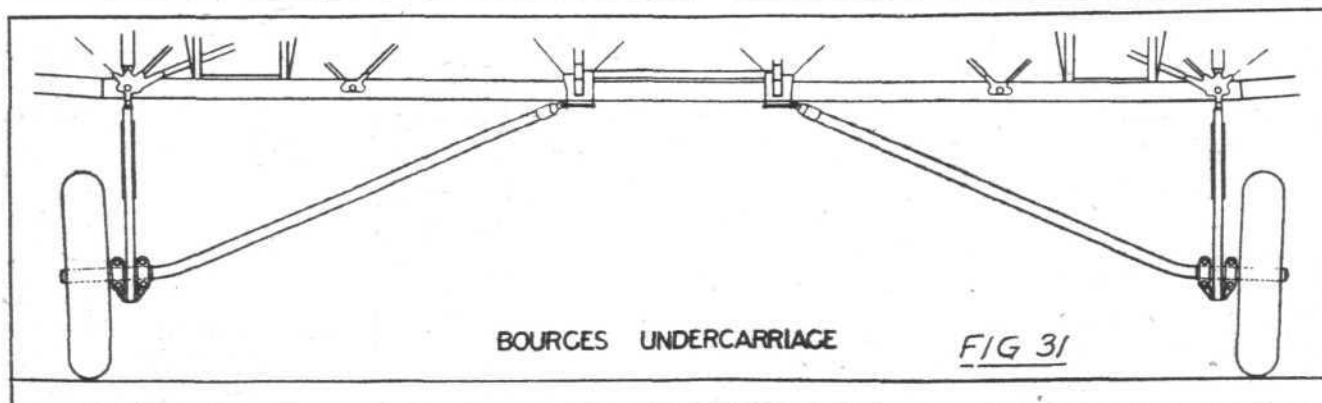


FIG 30

ARRANGEMENT OF
BOURGES UNDERCARRIAGE

BOURGES UNDERCARRIAGE

FIG 31

to the *fuselage* and carries the piston head in which is mounted the pressure relief valve and constant leak holes. Aluminium end castings are arranged to support the fairing, which encloses the shock-absorber rings and mounting spools. The lower spools are anchored to the lower end casting, which is free to slide on the central tubular member, and in consequence the load imposed by the shock-absorber rings is transmitted by the fairing to the upper end casting. An initial tension is given to the rings and the possible extension of the gear limited by a check cable anchoring the upper spools to the upper end casting.

Bourges Gear

(Figs. 30 and 31.) In the Bourges undercarriage Vee struts are arranged near the ends of the bottom centre wing section directly under the engine mounting struts. The two

axles are jointed to the *fuselage* on either side, and incline outwards to the Vee struts through which they are guided in a horn-block. The wheel is mounted on an overhung portion, allowing for quick and easy removal. Suspension is by rubber rings and oleo dashpot, but in this instance the two systems are entirely separate. The oleo gear is built into the horn-block and lies into the plane of the Vee struts thereby giving a minimum of resistance. The rubber rings are mounted on axle frames on either side of the Vee struts and pass under the apex of the Vee in the usual manner. Owing to the rearward inclination of the axle from its point of support on the *fuselage*, the ground reaction on the wheel gives rise to a couple tending to roll the axle over and cause the wheels to track incorrectly. This is provided against by arranging 10 rings forward of the axle and seven to the rear, the additional rings producing a correcting couple of the

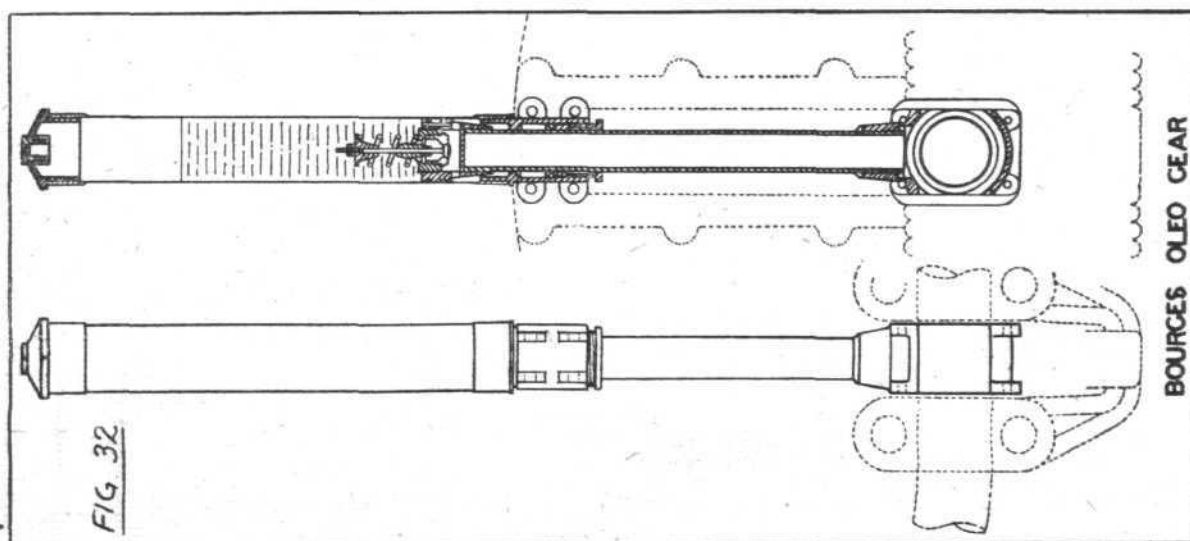
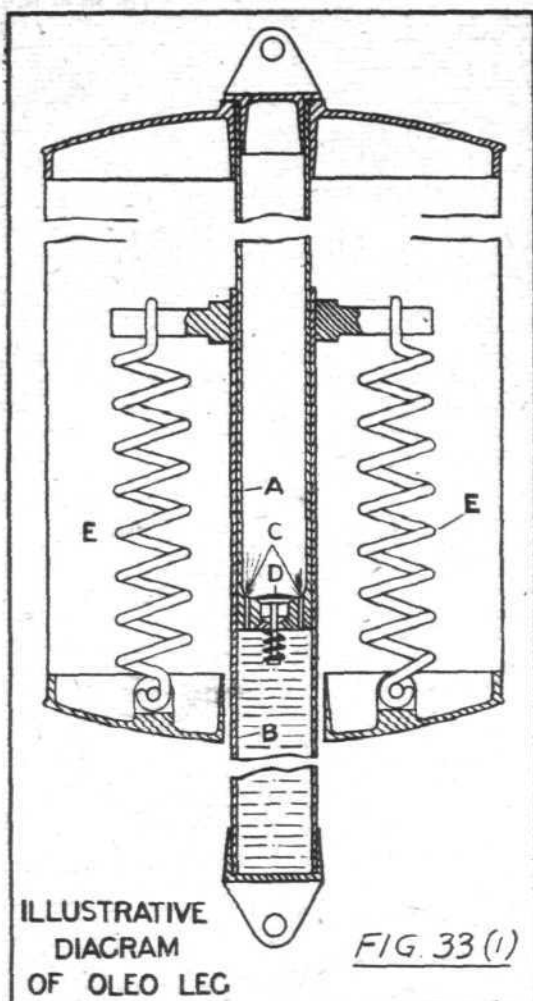


FIG 32

BOURGES OLEO GEAR



necessary magnitude for all relative positions of wheel and horn-block. Usual practice is inverted in the construction of the oleo leg (Fig. 32). The piston head and relief valve is carried by the internal telescopic member, which seats directly on the axle, and the external member is bolted up rigid to the horn-block. It is to be noticed that the total oil capacity is reduced as the piston head is advanced into the cylinder by reason of the volume of piston rod introduced. Allowance is made for the varying capacity by the provision of an air pocket above the oil, and the additional advantage is gained of a pneumatic cushioning action assisting the rubber suspension rings.

Braemar Gear

(Figs. 33, 34 and 35.) In the Braemar gear there are two wheels in tandem on either side of the fuselage. Each wheel is mounted on a separate axle, which is radiused from a point on the wing structure below the engine struts and is directed inwards towards the fuselage. An oleo leg connects the

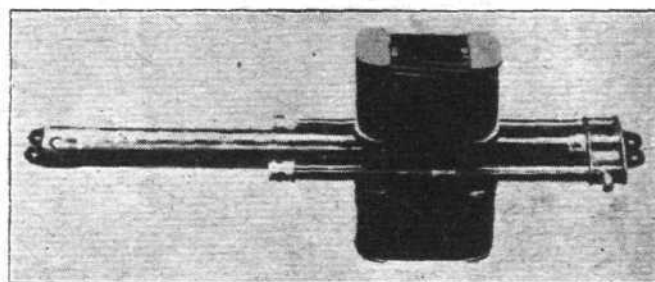


Fig. 36: Oleo gear on Braemar

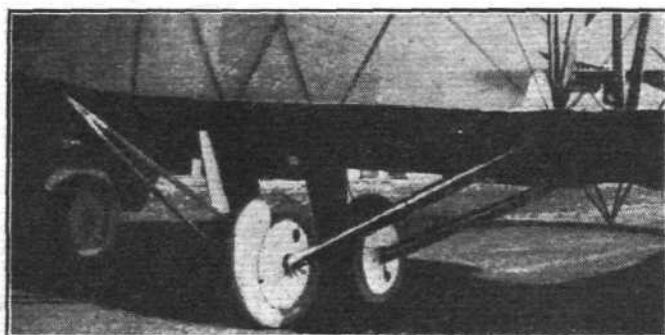


Fig. 33: "Braemar," with undercarriage attached

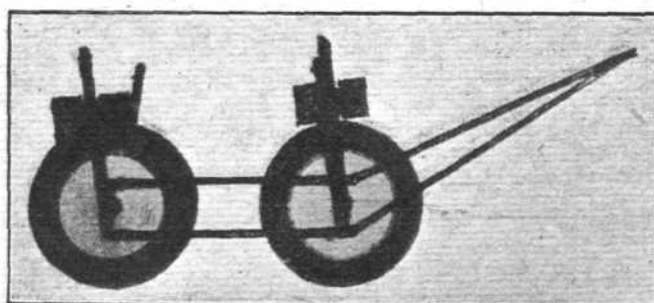


Fig. 34: Half-front view, "Braemar"

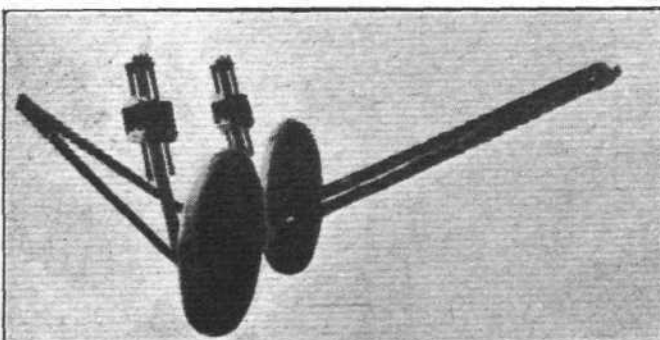
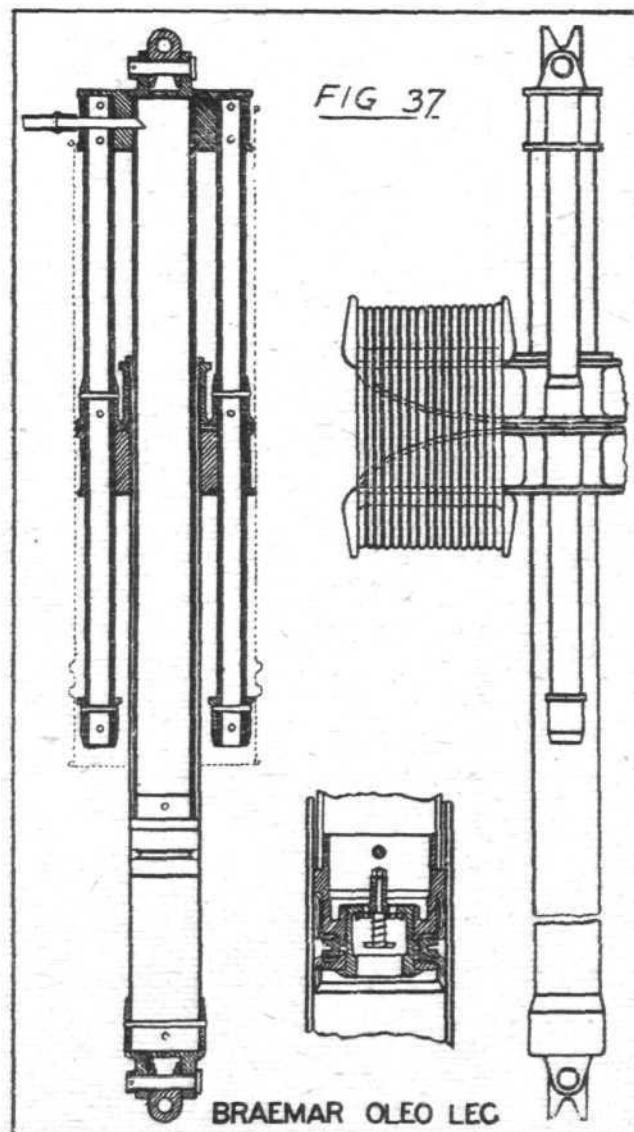


Fig. 35: Side view, "Braemar"



wheel end of all four axles to the fuselage. Motion of the wheels longitudinally is constrained by radius rods attached to the fuselage ahead of the undercarriage, the rear wheels being coupled to the front by a further pair of radius rods. The adoption of tandem wheels gives rise to a number of advantages. The weight of the machine is distributed on four wheels when taxi-ing without doubling the head resist-

ance. The forward pair of wheels may be set well forward of the centre of gravity of the machine, thus minimising the danger of nosing over in taxi-ing and landing, and this feature allows of a higher line of thrust than would otherwise be permissible. Also brakes may be fitted to the rear wheels since the breaking torque tending to nose the machine over is counteracted by the moment of the front wheel reaction about the C.G. The Braemar gear is arranged so that the rear wheels are just under the centre of gravity of the whole machine, and the front wheels 4 ft. ahead, and with this disposition the lengths of front and rear oleo legs and the strength of elastic, provide for a load distribution with the machine at rest of 37 per cent. on front wheels, 56 per cent. on rear wheels and 7 per cent. on tail skid. (Figs. 36 and 37). The oleo leg is constructed with the usual telescopic members, with the addition of two tubular guides arranged on either side, and is designed with the exceptionally long amplitude of 14 ins. During the first 7 ins. of stroke the oil dashpot only is in operation, and this is supplemented by the rubber suspension rings during the final 7 ins. This result is attained by the peculiar mounting of the suspension ring spool frames. The upper frame is rigidly fixed to the upper end of the external telescopic member whilst the lower frame is free to slide both on this member and on the tubular guides. The slide shows the gear in mid stroke. In the fully extended position the lower collars on the guide tubes are in contact with the under face of the spool frame. After the first 7 ins. has been traversed on oil alone the upper

collars on the guide rod abut on to the lower spool frame and further motion then brings the suspension rings into operation, and the remaining 7-in. stroke is made on oil and rubber suspension. The piston head is mounted on the internal telescopic member, and carries a relief valve which opens on the return stroke only. It will be observed that in taxi-ing, since the oil dashpot cannot sustain a static load, the rubber wings are always in operation, and the oleo leg is never fully extended until after the machine has taken off, when the weight of wheels and axle forces the oil past the reversed relief valve until the fully extended position is reached in readiness for the next landing. This partial separation of the functions of rubber rings and oleo dashpot would appear to be a desirable feature in that the greater portion of the energy represented by the vertical velocity in landing is immediately disposed of in the oil dashpot; an accompanying disadvantage would be expected in that the final extension is not positive, which may lead to the machine alighting on an uneven keel if one leg remains partly contracted after taking off.

It is understood that a relief valve opening on the landing stroke has been (or is to be) fitted, which would allow of the gear being accurately stressed in uniformity with the fuselage. Further, since with a valve the maximum permissible load cannot be exceeded in the early part of the travel, the shock absorbing capacity is increased within the limits of the permissible load.

(To be concluded.)

ROYAL AERONAUTICAL SOCIETY NOTICES

THE next meeting will take place at the Royal Society of Arts, 18, John Street, Adelphi, on Wednesday, February 4, when Squadron-Leader J. E. M. Pritchard, O.B.E., R.A.F., will read a paper on "Rigid Airships and their Development." Air-Commodore E. M. Maitland, C.M.G., D.S.O., R.A.F., will take the chair at 8 p.m.

An appeal has been received for subscriptions to a Royal Air Force Memorial Fund, which is being raised under the patronage of H.R.H. Prince Albert. The Council feel that in a matter of this sort the Society should be represented as a body and therefore invite members to send subscriptions for this fund to the Secretary of the Royal Aeronautical Society, or on before February 29 next.

The following members were elected at a Council meeting held on January 21:—

Fellows.—E. G. Walker, L. F. Plugge, Prof. A. Barr, Sir William Beardmore, Prof. J. D. Cormack, Sir John Hunter, Dr. Blackwood Murray, Gen. J. G. Weir.

Associate Fellows.—A. Knight Croad, A. W. Holden, F. J. Tippen, R. E. Russell, O. S. Stiles, The Hon. Alan Boyle, Sir John Reid.

Members.—H. Leitner.

Associate Members.—J. S. Lindsay, J. R. Maken, S. R. M. Naidu, J. W. P. Uren, J. Reid, R. E. Smith, F. J. Stuppen, C. M. Mortimer.

Foreign Members.—Melvin Hall, Augustus Post.

W. LOCKWOOD MARSH,

Secretary.

7, Albemarle Street, W. 1, January 23, 1920.

Bombay-Karachi Mail Postponed

OWING to damage to Bombay aerodrome by floods the inauguration of the aerial mail service with Karachi has had to suffer another postponement, this time until February.

The England-Australia Flight

It was announced by the Air Ministry on January 22 that Capt. Matthews left Constantinople on January 14 in the Sopwith "Wallaby" for Baghdad, and a later message reported his arrival at Baghdad at 2 p.m. on January 21, adding, "Capt. Matthews and his mechanic (Sergt. Kay) are both well."

Lieut. MacIntosh and Lieut. Parer, who are flying to Australia on a De H. 9, left St. Raphael for Italy at 12.30, and landed at the Centorelle Aerodrome at Rome on January 24.

Cape to Cairo by Air

AN official announcement made in Pretoria states that the Government has decided to support an official flight from the Cape to Cairo by South African pilots, and that it is at present in communication with the Air Ministry in London in regard to the arrangement of details.

And a Brooklands-Cape Flight

In this connection it may be noted that Capt. Broome and Capt. Cockerill, two ex-R.A.F. officers, left Brooklands at noon on Saturday in a Vickers-Vimy-Rolls aeroplane, fitted with a commercial body, in an attempt to fly to Cape Town, via Paris and Cairo. It is understood that the machine is intended for an important mission of which details cannot be published at present.

Transport in Africa

CAPTAIN FREDERIC SHELFORD, M.Inst.C.E., will deliver an address upon "Transport in Africa by Road, Rail, Air and Water" at a luncheon meeting of the African Society held at the Cannon Street Hotel, E.C., on Thursday, February 5, at 1.15 p.m. The chair will be taken by Sir Harry H. Johnston, the President. Tickets can be obtained on application

to the Secretary of the Society, 64, Victoria Street, S.W. 1.

Aviation Officials in France

It is announced that M. P. E. Flandin, the new Under-Secretary of State for Aeronautics in France, has chosen M. Bourgeois to be head of the Civil Aviation Department, while Commandant Casse will be Chairman of the military section of the Ministry.

Air Mails in Italy

OWING to the railway strike in Italy, it was necessary to organise aircraft services to carry the mails. Aeroplanes were used on the Rome-Pisa and Milan route, and airships between Milan and Turin and Milan and Venice.

International Aerodrome at Lausanne

THE municipal authorities of Lausanne have asked the Communal Council to vote 45,000 francs for the enlargement and improvement of the Lausanne aerodrome, which is to become an international station.

To Bohemia by Air

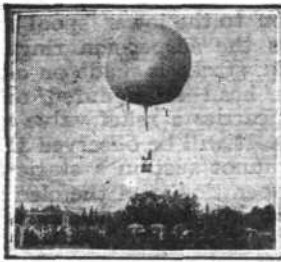
Gradually the aerial services from London to the Continent are extending; an Airco machine left Hounslow on January 26 for Bohemia, carrying one passenger.

Czecho-Slovak Flying Corps

FROM the details which have come through from Prague, it appears that the defence services provided for in the military estimates for Czecho-Slovakia recently submitted to the National Assembly, include a flying corps consisting of five battalions with 1,310 aeroplanes.

A New Aviatik

THE Aviatik works are now busy on the construction of a new giant aeroplane, the planes of which are of 43 metres span. Four 250 h.p. motors will be fitted, and in addition to the crew of six, accommodation will be arranged for 18 passengers.



THE PRINCIPLES OF RIGID AIRSHIP CONSTRUCTION*

BY A. P. COLE, R.C.N.C., A.M.Inst.N.A.

So far as is known, the only papers containing reference to the principles of rigid airship design or construction are those delivered by Herr Dornier to the German "Schiffbautechnischen Gesellschaft" in 1915 and by Mr. C. I. R. Campbell before the Institute of Naval Architects in 1919. The former paper dealt particularly with the Zeppelin, but while it contained valuable information, the figures and estimates that are deduced are based on performances of the earlier Zeppelins, and have been substantially improved upon during the War. The present paper is intended to state as far as possible the various principles underlying the design of a rigid airship, in the hope that such information may be of value in the progress of this important branch of aeronautics.

It is essential before considering the details of airship construction, to have some knowledge of the terms which are used, for instance, in specifying performances. These terms, while perhaps more or less familiar, are nevertheless very loosely applied, and it is very desirable that they should be defined with some degree of exactitude.

Explanation of terms

The *total lift* of a rigid airship is the buoyancy at ground level with all gasbags full and an excess pressure of gas of 5 mm. water above the atmosphere at the bottom of each bag, the ship being statically at rest and in equilibrium. The total lift is measured by the product of the volume of the gasbags in this condition and the difference between the air and gas densities. If hydrogen is used, the difference between the air and gas densities is arbitrarily taken, for the purpose of comparison between different ships, as

·068 lb. per cub. ft. capacity, or

1·09 kilograms per cub. m. capacity.

This figure is slightly lower than the average usually obtained in practice, so that specified airship performances are usually underestimated.

If helium is used, the standard lift is taken as

·0629 lb. per cub. ft., or

1·00 kilograms per cub. m.

The *fixed weights* of an airship include all items that are necessarily carried in flight, but which cannot be moved so as to affect the trim or heel of the ship. They may be subdivided into:—

1. Hull or structural weights.
2. Fabric weights.
3. Car and machinery weights.
4. Miscellaneous weights.

Hull weights include all structural items such as longitudinals, transverses, castings, fins and planes structure excluding the fabric covering, diagonal, net and chord wiring, fin inter-bracing wires and any other wires necessary for structural strength, the keel or corridor, structure at mooring point, etc.

Fabric weights include outer cover, fin, elevator and rudder covers, gasbags, and all cord network.

Car and machinery weights include all gondolas slung away from the ship, together with the suspending wires and struts, machinery, radiators, water and oil tanks.

Miscellaneous weights include all items which cannot be classified under the above heads, such as ventilation trunks, controls and telegraphs, wires and fittings, mooring and handling ropes, fixed petrol tanks, petrol filling and emptying systems, ballast bag fittings, automatic and manoeuvring gas valves, bomb triggers and shutters, electrical equipment, and wireless gear.

The *disposable lift* of an airship is the difference between the total lift and fixed weights. With the arbitrary value given above for the total lift, the disposable lift is usually expressed for the purpose of comparison of different ships, as a percentage of the total lift.

The disposable lift is balanced by the *non-dischargeable* and *dischargeable weights*. The non-dischargeable weights

are those items not included in the fixed weights which are necessarily carried in flight, but which cannot be discharged overboard or otherwise consumed for the purpose of attaining the maximum static height. They include crew, passengers, merchandise, landing ballast and emergency fuel, and such stores that it is necessary to land.

The dischargeable weights, which make up the balance, include water or other ballast (ex. landing ballast), petrol and oil (ex. emergency petrol and oil), stores, slip petrol tanks, etc.

The *maximum static height* is the height at which the ship will be statically in equilibrium with all the dischargeable weights discharged. For purposes of comparison between different ships, it is usually calculated on an initial lift of hydrogen gas on the ground of ·068 lb. per cub. ft., and in the normal atmosphere for S.E. England given in the Meteorological Glossary, page 54. The maximum static height is usually referred to as the *maximum height*. Appendix I gives the maximum static height for various Zeppelin ships. With the ship running ahead it can be exceeded by the use of elevators. The maximum height so obtained is called the *maximum dynamic height*.

The *pressure height* is the height at which the ship begins to blow off gas through the automatic valves. At any height below the pressure height the ship can manoeuvre without losing gas, but if at any time the ship rises above the pressure height gas will be discharged. The pressure height is then increased to the maximum height to which the ship has gone.

Limiting Factors to Size

In general, the dimensions of a rigid airship are limited by the size of the building and housing sheds. These limitations are length, overall height, overall width.

It is desirable for handling that there should be at least 10 ft. clearance over the top of the ship when the bumping bags are touching the ground. Except when it is necessary to berth two ships in one shed, the limitations of width do not materially affect the dimensions.

It may be mentioned that these limitations are already proving a bar to rapid development in airship design, since the natural tendency for progress and greater efficiency is in the direction of larger ships.

The transverse form of the ship at any section is usually determined from structural considerations, and is generally a polygon with an odd number of sides (17 in R 23, 25 in R 33) which can be contained within a circumscribing circle. An odd number of sides is preferable so as to have a longitudinal at the top of the ship and a flat side to form the corridor at the bottom.

The profile may be divided into three distinct portions, namely, entrance, parallel body, and run. From model results it appears that the factors most affecting resistance are the values of the three ratios

entrance	parallel body	run
diameter	diameter	diameter

Values of these factors for different ships are given in Table I.

TABLE I				
Ship.	Entrance diameter.	Parallel Body diameter.	Run diameter.	Length diameter.
R 23	1·04	7·36	1·70	10·1
R 31	1·81	5·0	2·67	9·48
R 33	2·33	1·875	3·97	8·17
L 71	2·33	3·12	3·97	9·42

Of the first three forms that of R 33 has the lowest coefficient of resistance. L 71 is similar to R 33 with 30 metres added to the parallel body.

The actual shape of the head appears to be of more importance than that of the tail. It is essential in designing these profiles that every discontinuity in the fair lines be

* Paper read before the Royal Aeronautical Society at the Royal Society of Arts, on Wednesday, January 21.

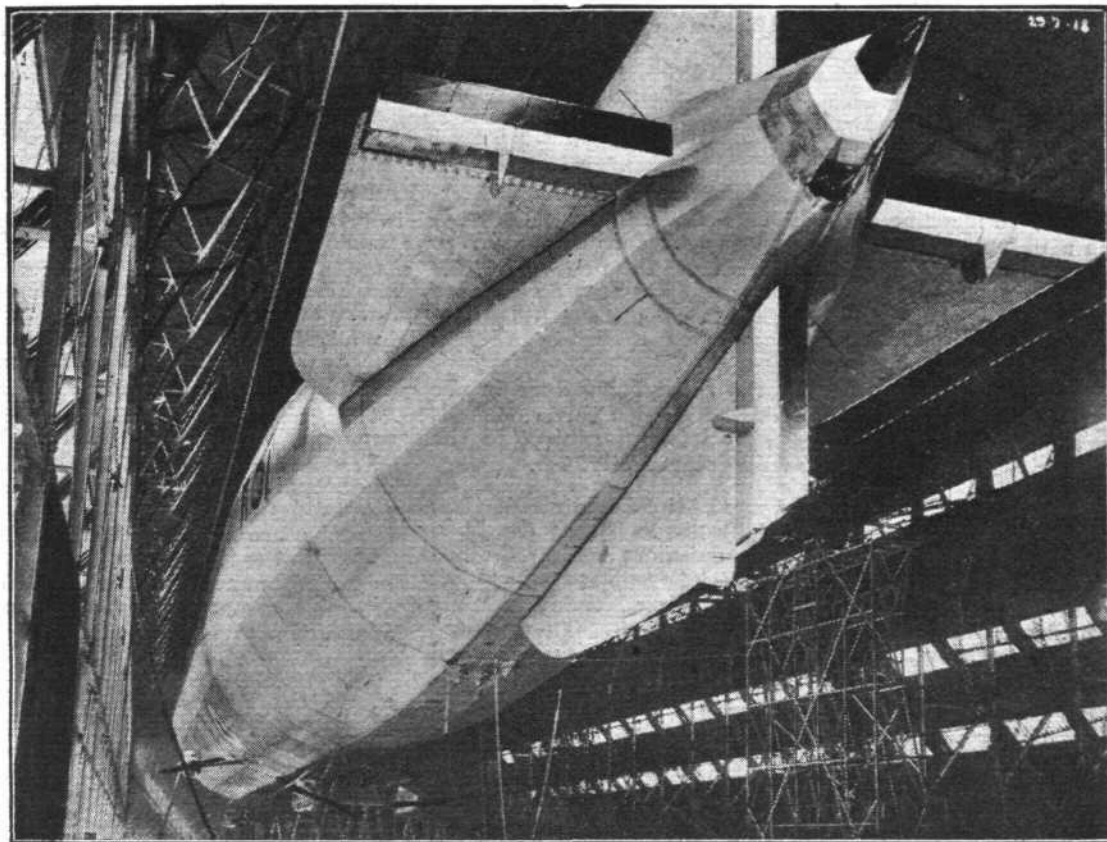


Fig. 1 : The stabilising surfaces at the stern of a rigid airship

avoided as much as possible. This is specially true on the head, and also where the head merges into the parallel body ; consequently the longitudinal girders forward are generally curved to the profile of the ship rather than built in straight lengths between transverse frames.

For similar ships, the volume of the gasbags (and, therefore, the total lift) varies practically as the cube of the diameter. Values of the non-dimensional factor—

$$\text{Volume}/(\text{Diameter})^3$$

for various ships are given in Table II.

TABLE II

Ship.	Vol. of gasbags/(Diameter) ³
R 23	6.63
R 31	5.45
R 33	4.07
L 71	4.96

Stabilising and Controlling Surfaces

Any elongated body, such as an airship, when moving in still air in the direction of its longest axis, will, if slightly inclined to the direction of motion, experience a moment tending still further to increase the inclination. The motion is, therefore, unstable, the moment being called the "negative righting moment." The existence of this moment is in general due to a region of positive air pressure over the bow and a corresponding region of negative pressure over the stern, which cause the line of action of the resultant force to be some distance forward of the centre of gravity. The effect of fitting stabilising surfaces at the stern of the ship is to introduce a righting moment caused by the air pressure upon these surfaces. Usually in rigid airships, two vertical planes, one above the ship and one below, are fitted, and two horizontal planes, one on either horizontal diameter. Part of each of the planes is made movable, so as to obtain controllability of the airship. The movable parts of the horizontal planes are termed elevators, and of the vertical planes, rudders. The total fin area includes the movable planes (Fig. 1).

The mathematical investigation of the stability of an airship when moving in still air either in a rectilinear or curvilinear path is difficult, and dependent for its solution on the elimination of certain of the resistance derivatives from the general equations of motion of a free body. Further the

Aviation in Canada.

A MESSAGE from the *Daily Mail* correspondent in Montreal states that Captain L. D. Stevens, head of the Devere Aviation School, Truro, Nova Scotia, Lieut. C. J. Barnhill, Instructor, Lieut. J. M. Stevenson, the Charlottetown Schools representative, Prince Edward Island, were in Montreal on January 20th, to meet representatives of the British Aircraft Manufacturing Company. It is understood that the Devere

application of any stability criterion based on small disturbances from a uniform path brings into account the virtual masses in various directions of motion and the virtual inertia of the airship, none of which quantities has yet been accurately determined. From model results, also, it appears that the stability criterion varies with the speed of the ship—the law of this variation not having yet been exactly determined. Hence it is not yet possible to predict what the fin area should be from theoretical considerations, and recourse must be made to experience with existing fin areas and the known capabilities of the ship in flight.

For the purpose of comparison of different ships, a factor

$$\frac{(\text{total fin area}) \times \text{length of ship}}{\text{Volume of ship}}$$

has been taken. This assumes that the instantaneous centre of rotation of the ship is very near the bow. The proportions of the moving surface and the total plane surfaces (fixed and moving) for various ships are given, together with the fin factor as defined above, in Table III.

TABLE III

Ship.	Fin factor = (Total fin area) (length of ship)		Controlling surfaces.	
	Volume of ship.		Total fin area.	
	horizontal.	vertical.	horizontal.	vertical
R 23	1.31	1.01	0.284	0.268
R 29	0.913	0.92	0.252	0.250
R 31	0.79	0.68	0.274	0.310
R 33	0.825	0.62	0.231	0.250

For guidance in using Table III it may be mentioned that experience with the actual ships in flight indicates that R 23 and R 29 are overstabilised, *i.e.*, difficult to turn. R 33, on the other hand, is slightly understabilised, and her controlling surfaces are too small, *i.e.*, the moment exerted by the controlling surface does not very quickly overcome the instability of the ship.

The point is of some importance, since if the ship is under-stabilised it is necessary to use the elevators or rudders continuously to keep her on a definite course, so that a portion of the controlling power is sacrificed and also the speed over the ground due to the alterations in course.

(To be continued.)

Aviation Company and the Prince Edward Island Aerial Transportation Company will amalgamate with Eastern Canada Air Lines, Ltd., and the British concern will back flying in the maritime provinces to the extent of £60,000. The capital of Eastern Canada Air Lines will be £100,000. It is reported that the Government's three maritime provinces will be asked to guarantee the company's 10-years 7 per cent. bonds.

AIRISMS

FROM THE FOUR WINDS

DOES the flight from Hounslow last Saturday in a Vickers-Rolls-Royce machine with Capt. Broome and Cockerill up, plus a passenger, mark the first stage in an air-journey to the Cape via Cairo? Race or no race, the first to fly this African route will make history just the same. So here are hearty good wishes to the pioneers in whomsoever they may be found.

MEANTIME the possibility of the flight being done in the opposite direction has increased, as the Cape Government is prepared to support a Cape-Cairo attempt, subject to the flyers being South Africans. And quite rightly, too.

SMART and very suggestive work of the *Evening News* last Monday, sending over to Calais by air to handle the Foch Dover-Patrol foundation-laying ceremony. Mr. Clifford Whitley, our contemporary's special representative, left Hounslow with a photographer at 9.10 on Monday morning in an Airco machine for reporting the event. They carried out their work and returned to Hounslow at 2.15 p.m., and in the later edition of the *Evening News* on Monday report and photographs of the ceremony at Calais appeared as if it had happened but at Charing Cross.

WHEN a war has to be won, temperament of a people has a deal to do with the result. The Germans may have had the will to win, but their temperament was not equal to their so-called "indomitable will." Our boys fortunately have the right temperament, and that's just the difference—the will automatically falls into line. And that temperament is the power to treat with a light heart and cool judgment the most serious position or dilemma. Particularly does this apply to every section of the R.A.F., and from the latest Indian papers to hand evidence of this same spirit crops out again in the Mahsuds campaign, in the doings of the boys at Christmas during intervals of bombing the recalcitrant tribesmen. A correspondent of the *Calcutta Englishman*, writing from Mandanna Kach, in describing how the Christmas was spent in camp, says:—

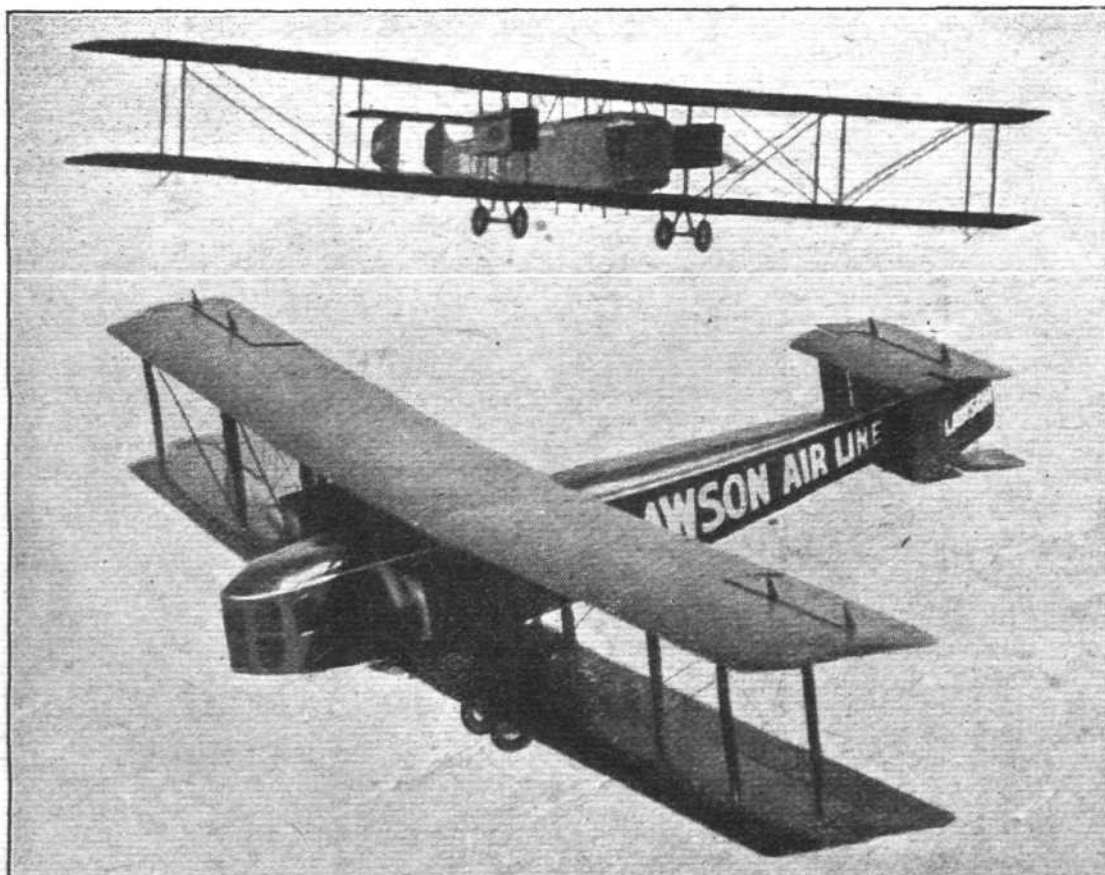
"The irrepressible youngsters of the Royal Air Force infused a little of Christmas spirit into command post during the midst of the operations. One airman, whose machine was gaily decked with tricolour stripes, flew over and dropped

a chit, 'Stand by to receive goose,' and presently a huge sack came hurtling through the air, which, on being opened, was found to contain a goose, a bundle of onions for stuffing, a box of dates, two tins of cigarettes and a box of Christmas crackers, with a characteristic note, 'With compliments from above and hell to the enemy.' Altogether the airmen had a joyful Christmas day, for they succeeded in blowing the top off one of the towers of Kotka, damaging another, and creating considerable unrest among the Mahsuds, who could be seen scuttling to caves like rabbits whenever a machine came overhead."

Yet our Government would let practically the major part of the units which go to make up our aerial supremacy be scattered to the four winds, whilst in every direction the Germans are instituting plans whereby their peaceful penetration in the air by means of planes and airships will presently be so pronounced that we shall be lucky if we are able to scramble through the unholy muddle in time to be on top once again.

By way of the latest instance. It is authoritatively stated that a super "Bodensee" type of airship has been completed at Friedrichshafen with which it is intended to establish a service between Switzerland, Germany and Sweden, to be extended later to Allied ports and the Mediterranean. This peaceful penetration item, trial trips of which will take place in February, contains restaurant and sleeping cars accommodating 18 passengers over and above the crew—which all sounds quite healthy from the peaceful penetration point of view. And we notice, having in mind the proposed visits to Allied ports, Dover, Harwich, etc., have now been notified as no longer "prescribed areas." Think it over.

INAUGURATED in November, we are glad to learn that the W.R.A.F. Old Comrades' Association is making good headway. Already 22 local branches have been formed, and initial steps have been taken for forming branches in 19 other centres. In addition to the formation of branches at home, it is intended to start others in the Colonies, as a great many ex-officers and other ranks of the W.R.A.F. have emigrated. The subject of employment forms an important side of this work. Fifty-six members have already applied to the asso-



Two views of the Lawson 26-passenger "Air Liner" taken during its recent 2,500-mile flight from Milwaukee to New York, Washington and back. This machine was described in "Flight" for September 11 last.

ciation for assistance in obtaining employment, and 44 applications from prospective employers have been received for ex-W.R.A.F. women. As regards other aspects of the work, the Birmingham branch has arranged sewing, first-aid, and physical training classes, and is also starting a games club, while the Regent's Park branch has started a concert party and also hopes to form a games club if it can procure a field. The Blandford branch heads the membership list with 108; Regent's Park comes next with 50; Air Ministry, 38; and Birmingham, 25. The following are the London secretaries:—W. and N.: Miss S. L. Young, 34, Brunswick Square, W.C.1; assistant secretary, Miss R. Freeman, 33, Lifford Road, Ealing, W.5. S.W.: Miss Cadman, 2, Linden Gardens, W.C.2. Particulars can always be obtained from the secretary of the Central Committee, Miss K. Hargreaves, The Corner, Finch Lane, Bushey, Herts.

FOR up-to-date innovation, the latest plan is hard to beat of the Airco firm for touring the American battlefields in France in anticipation of the expected great rush of Transatlantic tourists next summer. As at present conceived it is proposed to run a one day trip, starting from Paris and going via Chateau Thierry to Reims and Soissons being the chief feature. Arrangements are being made for a landing place at Reims in order that tourists may see the ruined cathedral. The aeroplanes will fly slowly over the American battlefield, passengers being provided with a booklet and a series of

Thomas's companies in relation to the proposal for amalgamation between the B.S.A. and the Aircraft Manufacturing Co. and Peter Hooker, Ltd. Sir Hallewell Rogers' letter is as follows:—

"The Aircraft Manufacturing Co. has, as is well known been one of the pioneers in aviation, and has, during the War, in addition to manufacturing a very large number of aeroplanes, supplied a great proportion of the designs for other factories in this country and the United States of America, both in aeroplanes, airships and accessories. It therefore to-day holds, and if desirable can retain, a unique position in all matters connected with aviation. Since the Armistice and the consequent cessation of Government orders, the Aircraft Manufacturing Co. has turned its attention to the manufacture of bodies for the motor trade, and is using its extensive premises at Hendon for this purpose, for which they are extremely well suited.

"The arrangement also involves an amalgamation with Peter Hooker, Ltd., Walthamstow, which is a concern owning a new and well-equipped factory engaged in the manufacture of internal-combustion engines of all kinds, including those suitable for motor cars and motor lorries, and if need be for aircraft, the factories having been equipped for the production of the well-known Gnome and Le Rhone aero engines. While your directors recognise the value of the commanding position of the Aircraft Manufacturing Co. in aviation matters, yet they, to a great extent, ignored this side of the question in



The Glen L. Martin "bomber" which is being used in America for the U.S. Mail Service. It is fitted with two Liberty-Twelve motors, and has a cargo-capacity of over 1,000 lbs.

photographs in order to locate the positions. The estimated cost of the trip is 650 fr.

Whether the other sections of the fighting area will be in like manner "harnessed" deponent sayeth not.

As an example of time saving by means of aeroplanes, a report from Lima records a very good specimen. A Curtiss biplane, chartered by an American cotton buyer on January 23, made the first commercial flight from Lima to Pisco, 130 miles south, in connection with a deal involving important cotton shipments. The trip, which was safely made in 2 hours, takes 24 hours by the slow coast steamers, which sail once every 10 days.

As a whole-hearted patriotic missionary in advocating the placing of our Empire in an unassailable position so far as supremacy in the air in Peace, which is synonymous with being so in War, is concerned, Mr. Holt Thomas is an outstanding figure in the present reshuffling of the world's affairs. Many have viewed askance his advocacy; he is naturally personally concerned that aviation should continue at any cost. But this he has very rightly denied. Whatever his past or future interests in aircraft may be, his great concern just now is to be found in his desire to see our Empire supreme. He is, comparatively, but slightly interested commercially whether aviation progresses or stops, although naturally he is prepared to take a hand in whatever may help to ensure the Empire getting there. In his latest move, in conjunction with the B.S.A., Mr. Holt Thomas has given bell and book for his statement of disinterestedness. It will be seen from the following intimation by Sir Hallewell Rogers, chairman, to the B.S.A. shareholders, the present position of Mr. Holt

coming to their decision to make the present amalgamation, as they are satisfied that the transaction will provide for this company very great and important additional manufacturing facilities, which are capable of producing sound and profitable business. Your directors are glad to say that Mr. G. Holt Thomas, the founder, main proprietor and chairman of the Aircraft Manufacturing Co., will join the board of the Birmingham Small Arms Co."

The last item of information is cause for congratulation to the B.S.A. shareholders.

REFERRING to Mons. E. Flandin, the new Under-Secretary of State for Aeronautics in the Millerand Ministry, one French paper has to fall back upon English, and dubs him "the right man in the right place." He is an aviator, having taken his pilot's certificate (No. 880) on a Maurice Farman on May 3, 1912.

A CASE of encephalitis lethargica has occurred at Hanwell (Middlesex). The case of a New York resident who slept for 102 days and nights was also recently reported.

Curious such a fuss should be made of these little episodes. We visited one or two works recently and noticed that it was a very common complaint. A rose by any other name, etc. Why not call it "Ca canny" and have done with it.

How the Bolshies deal with encephalitis lethargica is, perhaps, best exemplified by quoting the following from a *Daily Telegraph* correspondent of last week:—

"A message from Helsingfors reports that the Russian Bolshevik rulers are systematically endeavouring to force people to work, and that the six hours' working day, the

whole holiday on Saturday, and the other privileges which they granted to the proletariat have been abolished. In all the larger towns a compulsory 12 hours' working day has been inaugurated, with the same working hours on Saturday and Sunday. These regulations are being rigorously enforced as regards all classes. This change is evidently connected with the Bolshevik scheme for reviving the economic life of the community."

THERE would appear to be a certain amount of sanity in some of the Bolshie methods after all. Wonder whether citizens this side would like Freedom on similar lines.

Good idea of the Westminster Council to erect tablets on the premises on which the first and last air raid bombs were dropped, namely, the Lyceum Theatre, October 13, 1915, and 26A, King Street, St. James's, May 20, 1918—instead of placing them upon about nineteen places where the raiders laid their eggs.

ANYTHING from 70 to 100 aeroplanes are reported as having mysteriously been consumed by fire in the sheds of the German Naval Air Force at Warnemünde, just, *curiously*, when the Allied Commission which is to supervise the carrying out of the Peace Treaty, including Article 202 relating to the surrender of aircraft, were about to visit the district to check compliance with the requirements of that clause. It certainly looks like another rather foolish imitation of the Scapa Flow stunt, and possibly after all it is not such a bad thing to have happened thus. There will have to be either cash or kind in this handing-over business, and for ourselves we are rather inclined to put the value of any aeroplanes in hand at the German stations which the Allies are entitled to take possession of, as worth a good deal more when burnt and "compensated" for in hard cash—not marks, mark you—than when taken over as machines. What with the taking over, the removal, the cost of scrapping and goodness only knows what else—well, think it over for yourselves.

PROHIBITED AREAS IN

THE Air Ministry announces that the following Notice to Airmen No. 8 has been issued:—

The list of prohibited areas given in Schedule VI of the Air Navigation Regulations, 1919, has since been amended by two Orders made by the Secretary of State for Air, dated respectively November 17, 1919, and January 16, 1920, and the following list should be substituted for that given in the Regulations as originally issued:—

ORKNEY ISLANDS ..	An area enclosed by straight lines joining the following points:— TOR NESS, RORA HEAD, INGA NESS, HULL HEAD, OLD HEAD.
FIRTH OF FORTH ..	An area enclosed by straight lines between the following places:—HILL HOUSE (one mile south of DUMFERLINE), BLACKNESS PIER, DALMENY CHURCH, ICHMICKERY, HALLCRAIG POINT.
OSEA ISLAND ..	Three statute miles in all directions from the centre of OSEA ISLAND.
SHEERNESS ..	Three statute miles in all directions from GARRISON POINT excluding GRAIN aerodrome and all land belonging thereto.

R.A.F. Cadet College—Educational Appointments

THE Air Ministry announces that the following appointments have been made to the Educational Staff of the Royal Air Force Cadet College, which is being established at Cranwell, Lincs.: *Professorship of English*, Mr. S. P. B. Mais (Denstone and Christchurch, Oxford). Mr. Mais has served on the staff of Tonbridge, Sherbourne and Rossal, and was a member of the Lord Hugh Cecil Committee on the preliminary education of candidates for R.A.F. commissions.

Instructor in English: Mr. F. G. Swann (Shrewsbury and Pembroke, Cambridge). Previously an assistant-master at Clifton and Tonbridge.

Instructors in Mathematics and Science: Mr. B. A. Smith (Bridlington and Trinity, Cambridge). Previously of the Science and Engineering Department, Tonbridge. Mr. G. J. Pytches (Oundle and Caius College, Cambridge). Previously Head of the Engineering Department, Glenalmond.

A further announcement will be made at a later date in regard to the appointment of the Professor of Aeronautical Science.

R.A.F. Boys' Training Centre

In view of the many enquiries which are being received

So let the thing go on, so long as the Commission see that due payment is made for the machines as "going concerns."

VERY impressive is the story told in an account of recent operations in Mesopotamia. A British plane subsequently scouring the desert observed a solitary figure slowly making its way across the sands. On descending, the occupants of the aeroplane found that it was a British officer who had been badly wounded. They put him in the aeroplane and flew with him to the nearest hospital, more than 250 miles away.

WHAT is the meaning of the recent sudden crop of anonymous letters more or less subtly attacking Air-Marshal Sir Hugh Trenchard? "Hide the Truth Press" may, and possibly is, a well-deserved opprobrium for those whom the cap fits, but in personal attacks upon individuals the "Hide-the-name" correspondent to a newspaper is a bit worse. What has the Editor to say about it? Names, please, and then, perhaps, folk can see where they are.

THE introduction into an ultimatum of the possibility of attack by air as an ordinary proceeding should surely give one more hint to our Home authorities to put their aviation organisation into order for big things. In the ultimatum issued to Ramadan Shalash by Gen. MacMunn in regard to the position in Mesopotamia, the following clause formed part: "... in view of the fact that Sharif Faisal has officially disclaimed responsibility for your acts, and has ordered your withdrawal from Dair-es-Zor, the G.O.C.-in-C. regards the provisional guarantee of immunity from attack which he gave you a fortnight ago as rendered void by your own action, and he directs me to inform you that unless you at once cease from such acts he holds himself free to attack Dair-es-Zor by air or otherwise until such time as these actions cease, and he warns you and all the people of Dulaim ... districts that he will not hesitate to take such action as he considers necessary to maintain law and order in Mesopotamia."

THE UNITED KINGDOM

CHATHAM ..	.. Three statute miles in all directions from HOO CHURCH.
PORTSMOUTH ..	.. Two and a half statute miles in all directions from DOCKYARD CLOCK TOWER.
POOLE HARBOUR ..	.. Three statute miles in all directions from LYCHETT MINSTER CHURCH.
PORTLAND ..	.. Three statute miles in all directions from PORTLAND CASTLE.
DEVONPORT ..	.. Two statute miles in all directions from a point half a mile north of STOKE CHURCH.
PEMBROKE ..	.. Two statute miles in all directions from WEIR POINT.
CORK HARBOUR ..	.. Two statute miles in all directions from SPIKE ISLAND FORT.

The Order, dated November 17, 1919, also amended Regulation 1 (7). Aircraft are now forbidden to land in any of the above prohibited areas and to fly over any such area at a lower altitude than 6,000 ft., whereas previously flying over a prohibited area was forbidden, irrespective of altitude.

This Order, it will be noted, removes a large number of prohibited areas from the list.

in regard to the entry of boys for service in the Royal Air Force the Air Ministry announces that boys will, in future, be entered twice a year only, on the results of a competitive examination. They must be between the ages of 15 and 16½ years on July 1 and December 1 for the summer and winter entries respectively.

Details of the scheme are being prepared, and will be issued for information in ample time for the next examination, which will be held probably in June or July of the present year.

R.A.F. Separation Allowances

THE Air Ministry makes the following announcement:—
"Separation allowances for men serving in the Royal Air Force did not cease on December 31, 1919, but will continue to be admissible under the existing conditions pending a further announcement.

"As, however, the future of these allowances is at present under consideration, no guarantee as to continuance, either of present rates or of conditions of entitlement, can be given, except for those men for whom continued entitlement has already been expressly provided by Air Ministry Regulations or Orders."

THE ROYAL AIR FORCE

The classification of Lieut. R. G. Fussell is (T.), and not (Ad.) as stated in *Gazette* of Aug. 1, 1919.

The notification in *Gazette* of Oct. 28, 1919, appointing the following officers to permanent commissions is cancelled:—

Flying Officer S. M. Kinkead, D.S.C., D.F.C. (A.).

Flying Officer W. Sharpe, A.F.C. (A.).

The notification in *Gazette* of Dec. 2, 1919, appointing Flying Officer C. L. Wauchope (A.) to a permanent commission is cancelled.

Flying Branch

Second Lieutenants to be Lieutenants:—(Hon. Lieut.) N. W. Walmsley; May 16, 1918. L. E. T. Burley; March 1, 1919. N. Cook; March 26, 1919.

Pilot Officer J. E. Buckland to be Flying Officer; Oct. 1, 1919.

Lieut. G. R. Hunter, M.C. (Lieut., Cam'n. Highrs.) is granted a temp. commn. as Flying Officer (A.) on re-seconding to R.A.F.; Jan. 3.

Pilot Officer E. Henriques to be Pilot Officer (A.), from Unemployed List; May 11, 1919, with precedence next below Pilot Officer T. Buchanan.

Sec. Lieut. W. B. Aldred (late Gen. List, R.F.C., on prob.) is confirmed in rank as Sec. Lieut. (A.); July 29, 1918 (since killed).

The following Cadets are granted temp. commns. as Sec. Lieuts. (A.); Oct. 17, 1918:—W. E. MacDonald, S. G. Pond, A. M. Thompson, J. B. Walsh.

H. Inman (Sec. Lieut., Manch. R., T.F.) is granted a temp. commn. as Sec. Lieut. (O.); April 11, 1918.

Sqdn. Ldr. C. H. K. Edmunds, D.S.O., O.B.E., is placed on the half-pay list; Jan. 1.

The following relinquish their temp. R.A.F. commns. on return to Army duty:—Pilot Officer (Hon. Flying Officer) S. E. V. Quin (Lieut., the Welsh R.); Oct. 10, 1919. Flying Officer A. Murray (Lieut., Cam'n. Highrs.); Dec. 2, 1919. Flying Officer L. B. Potts (Lieut., S. Wales Bord.); Jan. 2. Flying Officer M. H. A. Fletcher (Lieut., R.F.A.); Jan. 9.

Sec. Lieut. F. Hill relinquishes his temp. R.A.F. commn. on ceasing to be employed; April 20, 1918.

(Then follow the names of 75 officers who are transfd. to the Unemployed List under various dates.)

Lieut. (Hon. Capt.) H. J. Bath resigns his commn. and is permitted to retain the rank of Capt.; Oct. 26, 1918 (substituted for notification in *Gazette* Sept. 10, 1918.)

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—W. A. MacRoberts (contracted on active service); Dec. 1, 1919. J. A. McFadden; Dec. 26, 1919 (substituted for notification in the *Gazette* of Feb. 4, 1919). A. G. Kaye (Lieut., Ches. R., T.F.) (contracted on active service); Jan. 2. H. Keeton (caused by wounds); Jan. 8. W. M. Edwards (contracted on active service); Jan. 9. F. L. Munslow (caused by wounds); Jan. 10.

The following Sec. Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—L. T. Carruthers (contracted on active service); J. H. Dunbar (contracted on active service); Jan. 8. G. A. H. Nudds (caused by wounds); Jan. 9.

The Christian names of Sec. Lieut. Archer Henry Neate are as now described, and not as stated in the *Gazette* of Aug. 1, 1919.

The surname of Sec. Lieut. A. E. Miller is as now described, and not as stated in the *Gazette* of Aug. 1, 1919.

The notification in the *Gazette* of Aug. 22, 1919, concerning Sec. Lieut. H. A. Sanders is cancelled.

The notification in the *Gazette* of Oct. 17, 1919, concerning Sec. Lieut. (Hon. Lieut.) A. Dunton is cancelled (notification in the *Gazette* of Dec. 2, 1919, to stand).

Administrative Branch

Flight-Lieut. E. W. T. Beck, D.S.O., M.C., to be Flight-Lieut. from (S.O.); Jan. 2.

Sec. Lieut. E. L. Girling to be Lieut.; Nov. 25, 1918. 1.

Pilot Officer R. H. Sturgeon to be Flying Officer; Oct. 1, 1919.

Flight-Lieut. A. G. Smith, M.B.E., M.C. (Lieut., 12th Lancers), relinquishes his temp. R.A.F. commn on return to Army duty; Jan. 12.

Lieut. W. W. Popperwell retires on retired pay; Jan. 17.

(Then follow the names of 26 officers who are transfd. to the Unemployed List under various dates.)

Flight-Lieut. H. G. Hutchinson, M.B.E., is placed on retired list on account of ill-health; Jan. 1.

The following Sec. Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—J. S. McCallum (contracted on active service); Dec. 26, 1919. F. D. McClinton (caused by wounds), D. Sparling (contracted on active service), S. Thompson (contracted on active service); Jan. 8. L. S. Farrell (contracted on active service); Jan. 9.

Sec. Lieut. A. F. Nethy (Sec. Lieut., Gen. List) resigns his commn.; Oct. 31, 1919.

Sec. Lieut. (Hon. Lieut.) G. Dodds is removed the Service, his Majesty having no further occasion for his services as an Officer; Jan. 17.

The Christian names of Lieut. William Barclay Maitland are as now described, and not as stated in *Gazette* April 25, 1919.

The initials of Lieut. C. G. L. Bowley are as now described, and not as stated in *Gazette* Nov. 27, 1919.

The initials of Capt. A. T. Dawson are as now described, and not as stated in *Gazette* Nov. 25, 1919.

The notification in *Gazette* Oct. 29, 1918, concerning H. Silvester, on page 12710, is cancelled.

Technical Branch

Lieut. W. J. Hembry is graded for purposes of pay and allowances as Capt. while employed as Capt., Grade (B), from March 5, 1919, to Aug. 11, 1919.

Lieut. W. J. Hembry is graded for purposes of pay and allowances as Lieut. while employed as Lieut., Grade (B.), from Dec. 1, 1918, to March 4, 1919.

Flying Officer A. S. G. Smith is graded for purposes of pay and allowances as Flying Officer whilst employed as Flying Officer, Grade (A); Aug. 27, 1919.

Sec. Lieut. C. C. Parrott to be Lieut., Grade (A.); Jan. 29, 1919, without pay and allowances of that rank prior to March 13, 1919 (substituted for notifications in *Gazettes* April 4 and Oct. 31, 1919).

Pilot Officers to be Flying Officers, Grade (A.):—C. R. Brown; Sept. 1, 1919. E. E. Crook. F. Simpson (substituted for notification in *Gazette* Dec. 5, 1919); Oct. 1, 1919. W. H. E. Thomas; Oct. 5, 1919.

Sec. Lieut. T. F. Beere to be Lieut. (without pay and allowances of that rank); April 15, 1919.

Sec. Lieut. R. E. Bottomley to be Lieut., Grade (B.); July 7, 1919.

Flying Officer G. P. U. Hardy (Lieut., R.G.A.) relinquishes his temp. R.A.F. commn. on return to Army duty; Nov. 17, 1919 (substituted for notification in *Gazette* Dec. 2, 1919).

Sec. Lieut. F. W. Osborne relinquishes his commn. on ceasing to be employed; Oct. 14, 1919.

(Then follow the names of 33 officers who are transfd. to the Unemployed List under various dates.)

Sec. Lieut. A. de Sandoval relinquishes his commn. on account of ill-health (contracted on active service), and is permitted to retain his rank; Jan. 7.

The notification in the *Gazette* of Oct. 24, 1919, concerning Sec. Lieut. F. Woombwell is cancelled (notification in the *Gazette* of Nov. 21, 1919, to stand).

The notification in the *Gazette* of Oct. 28, 1919, concerning Sec. Lieut. F. Osborne is cancelled.

The notification in the *Gazette* of Nov. 4, 1919, concerning Sec. Lieut. H. E. Young is cancelled.

The notifications in the *Gazette* of May 27, 1919, concerning Lieut. W. J. Hembry are cancelled.

The notification in the *Gazette* of Oct. 3, 1919, concerning Flying Officer L. R. Staddon (Warrant Shipwright, R.N.) is cancelled.

Medical Branch

H. J. Swan (late Flying Officer, R.A.F.) is granted a temp. commn. as Flight-Lieut.; Jan. 12.

(Two officers transfd. to the Unemployed List.)

(Then follow the names of six Cadets granted hon. commns. as Sec. Lieuts.)

Prob. Flight Officer J. E. Leaton is granted an hon. commn. as Sec. Lieut.; Nov. 7, 1919.

London Gazette, January 20

The following officers have been granted short service commns. in the ranks stated, with effect from Jan. 20 (except where otherwise stated). They will retain their seniority in the substantive rank last held by them prior to the grant of the short service commn.:—

Flight-Lieut. T. Hinshelwood, D.S.C., D.F.C. (A.) (with effect from Jan. 4).

Flying Officers.—E. G. Baxter (A.), G. L. Carter (A.), N. P. Dixon, A.F.C. (A.), G. E. Pyne (Ad.) (with effect from Jan. 1), A. W. Smith (T.).

Observer Officer (from Pilot Officer).—E. J. Munson (seniority Jan. 20).

The notifications appearing in *Gazettes* of the dates indicated below, appointing the following officers to short service commns., are cancelled:—Flight-Lieut. W. M. Fry, M.C. (A.); Sept. 16, 1919. Flight-Lieut. H. Hemming, A.F.C. (A.), Flying Officer M. T. S. Papenfus, D.F.C. (A.), Flying Officer A. C. Townend, A.F.C. (A.) (amended by *Gazette* of Nov. 28, 1919); Oct. 24, 1919. Flight-Lieut. H. I. Hughes (T.), Flying Officer V. A. Boule (A.); Dec. 5, 1919. Flying Officer S. Jones, D.F.C. (A.), Obsr. Officer H. Taylor, M.C.; Dec. 12, 1919.

Flight-Lieut. R. L. Stephenson-Peach, M.B.E. (T.), is granted a short service commn., with effect from Nov. 1, 1919, not Nov. 28, 1919, as stated in *Gazette* of the latter date.

The rank of Obsr. Officer A. W. C. Bayes is as now described, not Flying Officer (A.), as stated in *Gazette* of Nov. 28, 1919.

Permanent Commissions

The following officers are granted permanent commns. in the ranks stated:—Flight-Lieut. V. A. Watson, A.M. (S.O.). Flying Officer G. H. Harrison, D.F.C. (A.); Aug. 1, 1919.

The notification in *Gazette* of Aug. 1, 1919, appointing Flying Officer W. F. Wood (T.) to a permanent commn. is cancelled.

The notification in *Gazette* of Oct. 28, 1919, appointing Flying Officer J. W. Mullen (O.) to a permanent commn. is cancelled.

The following temporary appointment is made:—Staff Officer, and Class (Q.).—Flight-Lieut. E. W. F. Cherry, O.B.E., and to be actg. Sqdn. Ldr. while so employed; Dec. 17, 1919.

Flying Branch

Lieut. A. M. Lewis, A.F.C., is graded for purposes of pay and allowances as Capt. while employed as Capt. (A.), from May 1, 1919, to Aug. 28, 1919.

Second Lieutenants to be Lieutenants.—F. G. Aplin, M.C.; April 26, 1918. A. A. Malcolm; May 17, 1918 (since killed) (substituted for notification in *Gazette* May 6, 1919). W. D. Brownlee; March 1, 1919. J. H. H. Brunt; April 25, 1919. T. W. Brockley; May 28, 1919. R. E. M. Milne, J. A. Seldon; June 20, 1919. G. W. Chew; July 10, 1919. C. S. Gray; July 20, 1919. J. B. Cockin; July 30, 1919.

Pilot Officers to be Flying Officers.—J. McRobert; Aug. 4, 1919. A. Thomson; Aug. 23, 1919. A. F. Adams, J. Bowen, D. G. Fleming, P. J. Hayes, A. Lees, K. C. Mackenzie, A. H. Mitchell, A. Neeson, A. Page, J. F. H. Stevens, W. A. Thompson, H. J. White; Oct. 1, 1919. J. M. Walmsley; Oct. 26, 1919 (since demobilized); P. A. Kingsland; Nov. 16, 1919. J. H. Gibbons; Nov. 20, 1919. C. Walter; Nov. 29, 1919. L. W. Aiken; Dec. 24, 1919.

Pilot Officer E. J. Munson to be Pilot Officer (O.), from (Ad.); Oct. 1, 1919.

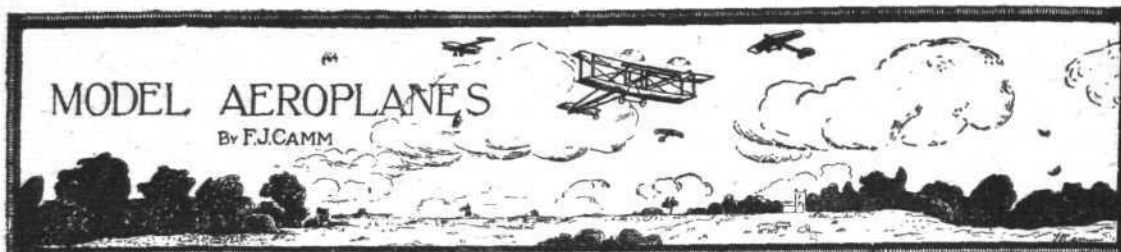
G. A. Goodman (Lieut., L.N. Lan. R.) is granted a temp. commn. as Sec. Lieut. (A.), and to be Hon. Lieut.; July 11, 1918 (since killed).

The following relinquish their temp. R.A.F. commns. on return to Army duty:—Flying Officer W. P. Eastwood (Capt., Canadians); April 14, 1919. Flight-Lieut. E. R. H. Pollak, M.C. (Lieut., R.F.A.); April 20, 1919. Flying Officer M. J. Nicol (Lieut., Can. Inf.); May 4, 1919. Flying Officer G. C. Young (Lieut., Seaf. Highrs.); Nov. 7, 1919. Flight-Lieut. H. G. Corby, M.B.E. (Lieut., R. Munster Fus.); (substituted for notification in *Gazette* of Dec. 16, 1919), Pilot Officer (Hon. Flying Officer) R. L. Rice (Lieut., R. Dub. Fus.); Nov. 10, 1919. Flying Officer S. A. Sharpe (Lieut., R.F.A.); Nov. 14, 1919. Flight-Lieut. F. X. Russell (Capt., R. Mun. Fus.); Nov. 15, 1919. Flying Officer A. V. Morton (Lieut., Glouc. R.); Nov. 17, 1919. Flying Officer C. R. O'Brien (Lieut., R. Lanc. R.); Nov. 21, 1919. Flying Officer S. A. Packman (Lieut., actg. Capt., R.F.A.); Nov. 25, 1919. Flying Officer A. S. Moynihan (Lieut., R.F.A.); Dec. 7, 1919. Flying Officer L. M. Elworthy (Lieut., Essex R.); Jan. 3. Flying Officer W. J. Corbishley (Lieut., York. and Lanc. R.); Jan. 6. Flying Officer F. G. Sawyer (Lieut., R.F.A.); Jan. 15.

Capt. C. W. Baldwin relinquishes his commn. on ceasing to be employed; Jan. 24, 1919.

(Then follow the names of 83 officers who were transfd. to the Unemployed List under various dates.)

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—P. E. Mercer (caused by wounds); Jan. 13. P. R. Hampton (contracted on active service); Jan. 14.



NOTE.—All communications should be addressed to the Model Editor.

Elementary Principles of Aerodynamics

An aeroplane would fly with any sort of framework, but without planes or a screw it would be impossible for it to do so, for it is upon the reaction of these upon the air that flight depends.

The air is a fluid and in common with all other fluids possesses mass and weight. If an inclined aerofoil is driven through the air it acts upon the latter as a wedge and displaces a certain weight of the fluid, and since the angle of aerofoils

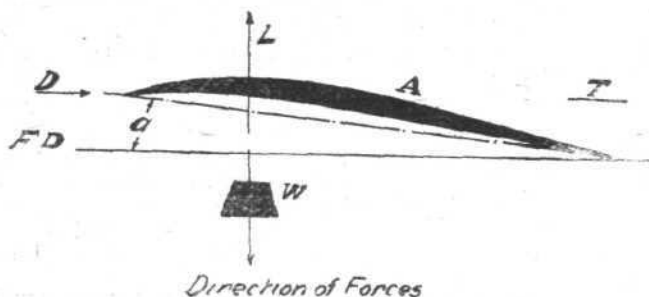


Fig. 1

is usually a positive one (the leading edge being placed higher than the trailing edge), it follows that the air is displaced or deflected in a downward direction. The quantity or weight of air so displaced will depend upon the speed at which the aerofoil is driven and also upon its area. Now, since action and reaction are equal, it will easily be followed that if the plane be driven at a certain speed the weight of the air depressed will equal the weight of the plane. Fig. 1 will help to render this more explicit. A section of the plane is represented by A, FP the flight path in the direction shown by the arrow, L the component for lift due to the downward velocity of air, and W the weight lifted. The angle of incidence is shown by a , and the direction of the force or thrust moving the plane is given by T, whilst D is the reaction (or drift) of the thrust. In order that the plane may lift, the weight of air deflected must at least equal the weight of the plane, and the greater the weight of air displaced the higher will the plane ascend. There is, of course, a limit to the angle of incidence at which the plane may be set, and if this angle (the critical angle) be exceeded, the lift gradually commences to diminish. There is, too, an angle at which it will give a maximum lift, which, as far as models are concerned, can only be determined by experiment. It has been stated that the angle of incidence is always a positive one; this, of course, applies only to full-size machines, because unless the plane of a model is quite flat (uncambered, and therefore true "planes") it may be placed on the machine without any angle at all. Indeed, in certain instances, it may even have a negative angle. In such a case, however, it is the top of the plane which does most of the work. It must, of course, be borne in mind that even though the chord of such an aerofoil does make a negative angle with the line of flight, the trailing portion still makes a positive angle with it. The top lift is greater than the bottom; with flat planes it is equal.

(To be continued.)

The Autoplan C.A. Motor.

Has any reader one of the above motors he wishes to dispose of? If so I should be glad to hear from him. The motor was from the well-known house of Bing, and is probably the most successful commercial engine yet produced. The writer also wishes to obtain one of the little three-cylinder carbon dioxide engines driven by CO₂ contained in a cylinder similar to a Sparklet bulb.

A Compressed-Air Gauge

Fig. 2 shows a simple home-made pressure-gauge for compressed air containers. Under pressure the flexible tube has a tendency to straighten out, so actuating the rack and pinion, the pointer or hand being attached to the latter.

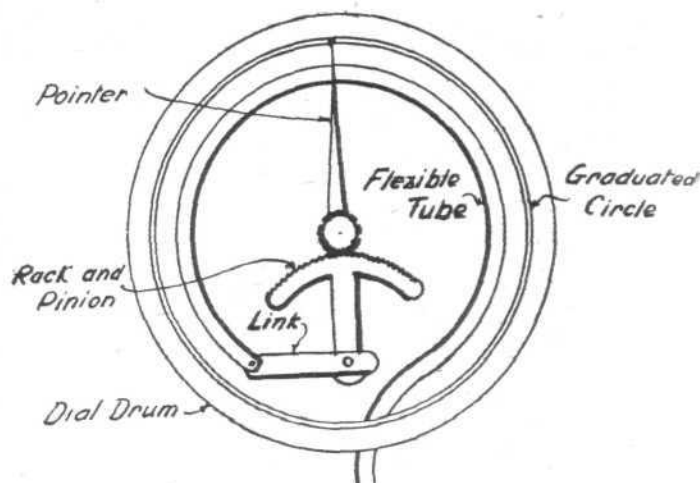
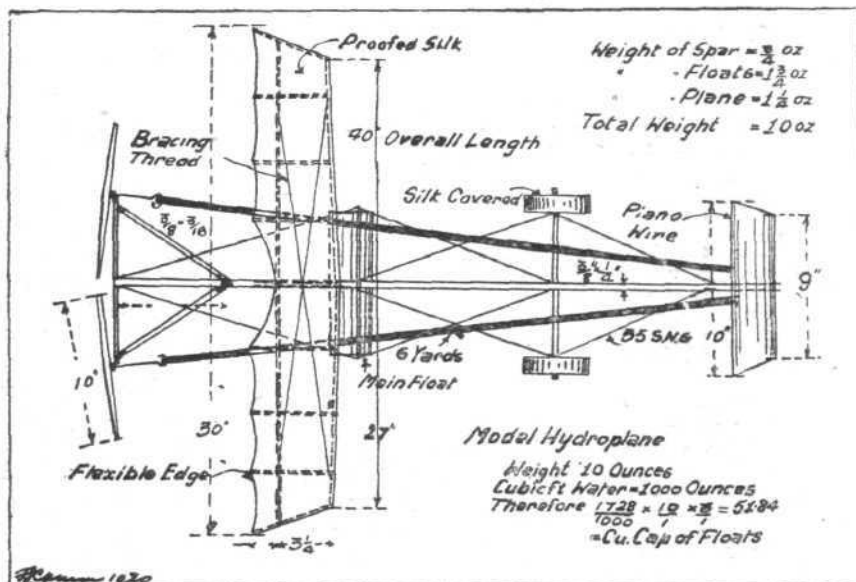


Fig. 2

The graduations should be marked by inflating the container to a known pressure in periods of, say, 10 lbs. This can be effected with a foot-pump with a pressure-gauge attached.



A Model Hydroplane

Above I am giving a plan view of the model hydroplane shown in perspective on p. 29. On the drawing is the simple calculation hitherto referred to. The floats were made of whitewood, silk covered, and proofed with the coat of gold size and two thin ones of coach varnish. They stood immersion with load for 24 hours without leakage, and are of streamline section. They should be made of high aspect ratio so that they at least support their own weight in the air. The front floats should be set at an incidence of 1 in 5, and the rear one 1 in 10. A flexible trailing edge was given to the main-plane by stretching a thread from end to end, fastened at each rib by passing it through a hole drilled in the rib extension and making a bight. The rest of the details may be gleaned from the drawing.

SIDE-WINDS

As usual, the annual staff dinner of Messrs. Handley Page, Ltd., held on Saturday last at the Connaught Rooms, was a very successful affair. There were some 500 guests, and Mr. and Mrs. Handley Page, who welcomed them, must have put their arms through a special course of training for the ordeal. The toast of the firm was proposed by Mr. R. S. Hubbard, and Mr. F. Handley Page, C.B.E., who on rising to respond was accorded musical honours, said that they hoped to make England the centre of a world-organisation which would be associated with the firm. The object of the firm was to combine efficiency with economy in inaugurating commercial flying. Aerial invasion, whether it was near or far, was bound to come, and we should make preparations to meet it. During the dinner, the Bradfield orchestra played a selection of music, and afterwards there was a musical programme which was well received.

FOUR American ladies were flown to Paris in a Handley Page aeroplane recently, and it is anticipated that air transport will be largely utilised by American tourists during the spring.

AMONGST the goods recently carried between London and Paris by Handley Page aeroplanes, have been consignments of satin, scents, jewellery and sample boxes of apples. The growing confidence in commercial flying is indicated by the fact that a London firm recently sent a number of valuable antique vases by air to Paris to assure that they would not be damaged by the rough handling to which they would be subjected if carried by steamer or rail.

THE Vacuum Oil Co., Ltd., recently announced an increase in the price of Gargoyle Mobiloils, which was to take effect from the 15th inst.

MESSRS. BARIMAR, LTD., welding engineers, 10, Poland Street, London, W. 1, have now established branch factories at 48, Rue d'Alsace, Clichy (Seine), France, with a staff of British experts, under the direction of Mr. Cyril Rose. The new works are completely equipped with the latest and most approved welding plant, and machinery installations, including portable equipments for the execution of repairs *in situ* in any part of French territory. The establishment of a factory in France will render unnecessary the transmission

of broken machinery across the Channel to the company's London works, and incidentally save much time and money now spent on rail and steamship journeys.

THE response made by Irish residents to Barimar's enterprise in opening branch works at 185, Great Brunswick Street, Dublin, shows that the company's new departure is greatly appreciated. There is, of course, a great saving of time and money, the long sea voyage and rail journey to London being now obviated.

STRIKING tribute to the efficacy of repairs undertaken by the Irish branch comes from Mr. J. Trimble, the chief officer of the Londonderry Fire Brigade, who expresses great admiration for the care with which a casting of intricate design has been strongly welded in exact alignment. The fractured machine is of American manufacture, and, as Mr. Trimble remarks, it would have been necessary to send to the United States for a spare part, but for Barimar's excellent repair. "It is now," says the Fire Chief, "as good as new."

THE Rotax Motor Accessories Co., Ltd., announce to old and new friends that their northern depot at 291-3, Deansgate, Manchester, is being re-opened on the 26th of this month. The supply and fitting of Rotax lighting and starting equipments will form the chief business to be transacted, while a repair department and garage has also been established.

MESSRS. C. A. VANDERVELL have for some time gone in for the extensive manufacture of replacement batteries for American cars, and these can now be supplied for all the leading and most popular American models.

A GOOD deal of curiosity is being aroused as to the nature of the new ignition system which is, we hear, to be combined with the C.A.V. dynamo lighting and starting installation.

THE small airship which is being built for the Japanese Government by Messrs. Vickers, Ltd., is to be engined by the Sunbeam Motor Car Co., Ltd., the power unit consisting of two 100 h.p. 6-cylinder vertical "Dyak" engines, similar to those used by the British Admiralty on the "S.S." type of airship.

Air Navigation Research

WITH the approval of the Lords Commissioners of the Treasury, Maj. H. E. Wimperis, R.A.F., has been transferred from the office of the Crown Agents for the Colonies to the Air Ministry to take up the position of head of the Air Navigation Research Section.

The London-Paris Mail

AT the end of last week the Airco aerial postmen had flown for 22 weeks between London and Paris and, in spite of unfavourable weather on 105 days, they had accomplished 214 aerial journeys, covering 59,562 miles, at an average speed of more than 100 miles an hour.

H.P. Paris and Brussels Air Services

ON the H.P. London, Paris and Brussels air services between September 2, 1919, and January 22, 1920, 917 passengers and 43,066 lbs. of freight have been carried over a distance of 64,293 miles.

A Handley Page commercial aeroplane recently carried £3,500 worth of jewels to Paris, which included a jade necklace valued at £2,300. Precautions were taken to safeguard the jewels in the event of a landing between London and Paris.

Aerial "Lorries"

MACHINES especially fitted to carry freight are being introduced on the Handley Page London, Paris and Brussels air services. This is resulting in a reduction of rates, where large quantities of goods are carried. The new scale is as follows:—

Up to 10 lbs. in weight	.. ..	2s. 6d. per lb.
From 10 lbs. to 20 lbs.	.. ..	2s. 3d. "
From 20 lbs. to 50 lbs.	.. ..	2s. 0d. "
From 50 lbs. to 100 lbs.	.. ..	1s. 9d. "
100 lbs. and over	.. ..	1s. 6d. "
Passengers' baggage (unaccompanied by passengers)	.. ..	1s. 6d. "
Minimum	.. ..	5s. 0d. "

The above figures indicate how the cost of air transport can be reduced, where large and regular loads are carried.

If the Government would guarantee daily consignments of mails or freight, as is done in France, America and other countries, the present charges for transport by air could be considerably lessened.

A Footpath to Cricklewood

THE closing of a public footpath through Cricklewood Aerodrome has been recommended in view of the undertaking of Messrs. Handley Page to construct a new road at a cost of about £15,000.

Aviation on N.W. Frontier

A TELEGRAM from the N.W. Frontier, dated January 14, stated that in the fighting for the Ahnai Pangi Pass a Bristol aeroplane was compelled to make a forced landing in the river bed, and both the pilot and the observer were hit, but escaped through a storm of bullets. The machine was wrecked.

A later message states that an aeroplane crashed in Shuza Tangi on January 15. Pilot and observer brought in safely by Bhattanni on 16th.

Picketing operations continued on January 17 in Southern Waziristan. Enemy collecting in nullah were surprised and bombed by aeroplanes, when our infantry and guns obtained good targets. Our casualties five killed, 12 wounded. Enemy casualties unknown.

The Blériot Mishap

THE great Blériot biplane, which was exhibited at the last Paris Salon, crashed during a trial trip at Buc on January 21. The pilot, Bartholot, died from his injuries while being taken to the hospital at Versailles.

Military Aviation in Switzerland

AFTER a lengthy controversy the Swiss Federal authorities have granted a credit of 2,000,000 francs to be used for establishing military aviation in Switzerland. Of the total, 300,000 francs is ear-marked for the purchase of new machines. Maj. Isler, who is at the head of Swiss military aviation, has withdrawn his resignation which was sent in when the Government wanted to reduce the credit to 1,200,000 francs.

LEGAL INTELLIGENCE

Aeroplane Insurance

In the case of Dunn and another v. Campbell and others, which was heard before Mr. Justice Roche, in the King's Bench Division on Monday and Tuesday, the administrator of the estate of Capt. Dunn, who was killed in an aeroplane accident, and the builder of the Tarrant aeroplane claimed £4,000 under a policy of insurance.

After the hearing of evidence Mr. Compston, for the defendants, submitted that on the evidence the warranty had been made out. The defendants would not insure the first flight in any circumstances, and they would not insure the machine for anything after the first flight unless Messrs. Ogilvie had certified it as safe.

The wording of the insurance policy that the assured should be covered for three months "from the time of the first flight," must mean that the first flight itself was excluded.

Further, he submitted that in any event the trial which was taking place at the time of the accident was not, and was not intended to be, a flight, and consequently would not come within the policy at all, however the policy was construed.

Further, this was an accident policy and must be taken to embody all the ordinary clauses of an accident policy, and one of those clauses which was always understood was that the insured must not expose himself to unusual danger; and Capt. Dunn here exposed himself to undue risk in working a machine which competent opinion had pronounced to be unsafe.

Mr. Wright, in reply, submitted that the contract was complete when the slip was signed accepting the proposal, and nothing more could be read into the policy.

Mr. Justice Roche, after reviewing the facts, said that the contract was contained in the proposal and slip. Four defences were raised. First, it was said that the contract was subject to a warranty that a flight would not take place unless the machine was passed by Messrs. Ogilvie as safe. It was true that Messrs. Ogilvie were not satisfied, though other gentlemen representing the Government were satisfied. He was not required to find which of those parties, both of them highly competent, was right. He had no hesitation in finding that the alleged warranty was not part of the contract. It was really a question of the intention of the parties, and he was satisfied that Mr. Barber never had intended to make this condition a part of the contract; otherwise the condition would certainly have been inserted in the proposal or the slip.

Secondly, it was said that the first flight of the machine was excluded, but he felt that the natural construction of the phrase in the policy "from the time of the first flight," was that it included the first flight and dated from the beginning of it. He found, therefore, that the policy included the first flight.

Thirdly, it was said that the trial was not a flight at all: but, on the evidence, he thought that there could be no doubt that Capt. Dunn was trying to take the air. He might have thought that matters were going so favourably that he had better there and then begin to fly without stopping to disembark Grossart, or he might have found that he was obliged to rise as his speed had become too great.

Lastly, it was said that the policy did not cover death by exposure to exceptional danger or by Capt. Dunn's own negligence. But that depended on the fact that a condition to that effect was inserted in the policy which was not drawn up until long after the accident. No term of the kind appeared in the proposal or slip, and he could not accept the suggestion that it formed part of the contract.

There must, therefore, be judgment for the plaintiff executor, with costs, but without interest.

A stay of execution was granted on condition that if the appeal failed interest at 6 per cent. would be paid.

"Dunn and Others v. Campbell and Others"

Messrs. DOWNING, HANDCOCK, MIDDLETON AND LEWIS write to us as follows:—

OUR clients, the Aviation and General Insurance Co., Ltd., of 56, St. James Street, S.W. 1, have had numerous cuttings from papers sent to them with regard to the above action which is now being tried in the High Court in connection with the Tarrant triplane accident. These cuttings have been sent apparently on the assumption that our clients were interested as insurers.

Our clients are in no way interested, or in any way concerned in the action that has been brought. They effected no insurance on this triplane or on any of the lives of those on board.

We shall be much obliged if you will publish this letter.

22, Great St. Helens, E.C. 3.

January 27.

The B.R. Engine

THE Royal Commission on Awards to Inventors, Mr. Justice Sargent presiding, further heard the claim by Capt. Bentley in respect of the B.R. engine. The claim was partly heard last December.

The Attorney-General said that a sum of £107,000 was involved in this claim respecting the B.R. 1 and B.R. 2 engines. These engines were of very substantial utility, but any claim that they were a determining factor in British air supremacy was wholly illusory. At the time of the Armistice the fighting machines at the front were fitted with 65 per cent. of other engines. The Air Department recognised the valuable work and great zeal of Capt. Bentley, and he would not for one moment suggest that there should not be granted to him a reasonable sum.

The Chairman said that the Commission would consider their award.



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Abbreviations:—cyl. = cylinder; I.C. = internal combustion; m. = motors

APPLIED FOR IN 1915

Published January 29, 1920

17,066. F. HANDLEY PAGE. Mounting of wings of aircraft.

APPLIED FOR IN 1918

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published January 29, 1920

5,321. C. J. H. MACKENZIE-KENNEDY and E. A. VESSEY. Power plant for aircraft. (137,078.)

14,674. H. TOLPUTT. Aircraft. (137,082.)

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